THE PANAMA CANAL

SERVICE MONOGRAPHS
OF THE
UNITED STATES GOVERNMENT
No. 44
INSTITUTE FOR GOVERNMENT RESEARCH

UNIVERSITY OF MAINE

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THE PANAMA CANAL

ITS HISTORY, ACTIVITIES AND ORGANIZATION

THE INSTITUTE FOR GOVERNMENT RESEARCH

Washington, D. C.

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THE PANAMA CANAL

ITS HISTORY, ACTIVITIES AND ORGANIZATION

BY
DARRELL HEVENOR SMITH

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FOREWORD

The first essential to efficient administration of any enterprise is full knowledge of its present make-up and operation. Without full and complete information before them, as to existing organization, personnel, plant, and methods of operation and control, neither legislators nor administrators can properly perform their functions.

The greater the work, the more varied the activities engaged in, and the more complex the organization employed, the more imperative becomes the necessity that this information shall be available—and available in such a form that it can readily be utilized.

Of all undertakings, none in the United States, and few, if any, in the world, approach in magnitude, complexity, and importance that of the national government of the United States. As President Taft expressed it in his messages to Congress of January 17, 1912, in referring to the inquiry being made under his direction into the efficiency and economy of the methods of prosecuting public business, the activities of the national government "are almost as varied as those of the entire business world. The operations of the government affect the interest of every person living within the jurisdiction of the United States. Its organization embraces stations and centers of work located in every city and in many local subdivisions of the country. Its gross expenditures amount to billions annually. Including the personnel of the military and naval establishments, more than half a million persons are required to do the work imposed by law upon the executive branch of the government.

"This vast organization has never been studied in detail as one piece of administrative mechanism. Never have the foundations been laid for a thorough consideration of the relations of all of its parts. No comprehensive effort has been made to list its multifarious activities or to group them in such a way as to present a clear picture of what the government is doing. Never has a complete description been given of the agencies through which these activi-

ties are performed. At no time has the attempt been made to study all of these activities and agencies with a view to the assignment of each activity to the agency best fitted for its performance, to the avoidance of duplication of plant and work, to the integration of all administrative agencies of the government, so far as may be practicable, into a unified organization for the most effective and economical dispatch of public business."

To lay the basis for such a comprehensive study of the organization and operations of the national government as President Taft outlined, the Institute for Government Research has undertaken the preparation of a series of monographs, of which the present study is one, giving a detailed description of each of the fifty or more distinct services of the government. These studies are being vigorously prosecuted, and it is hoped that all services of the government will be covered in a comparatively brief space of time. Thereafter, revisions of the monographs will be made from time to time as need arises, to the end that they may, as far as practicable represent current conditions.

These monographs are all prepared according to a uniform plan. They give: first, the history of the establishment and development of the service; second, its functions, described not in general terms, but by detailing its specific activities; third, its organization for the handling of these activities; fourth, the character of its plant; fifth, a compilation of, or reference to, the laws and regulations governing its operations; sixth, financial statements showing its appropriations, expenditures and other data for a period of years; and finally, a full bibliography of the sources of information, official and private, bearing on the service and its operations.

In the preparation of these monographs the Institute has kept steadily in mind the aim to produce documents that will be of direct value and assistance in the administration of public affairs. To executive officials they offer valuable tools of administration. Through them, such officers can, with a minimum of effort, inform themselves regarding the details, not only of their own services, but of others with whose facilities, activities, and methods it is desirable that they should be familiar. Under present conditions services frequently engage in activities in ignorance of the fact that the work projected has already been done, or is in process of execution by other services. Many cases exist where one service could

make effective use of the organization, plant or results of other services had they knowledge that such facilities were in existence. With the constant shifting of directing personnel that takes place in the administrative branch of the national government, the existence of means by which incoming officials may thus readily secure information regarding their own and other services is a matter of great importance.

To members of Congress the monograph should prove of no less value. At present these officials are called upon to legislate and appropriate money for services concerning whose needs and real problems they can secure but imperfect information. That the possession by each member of a set of monographs such as is here projected, prepared according to a uniform plan, will be a great aid to intelligent legislation and appropriation of funds can hardly be questioned.

To the public, finally, these monographs will give that knowledge of the organization and operations of their government which must be had if an enlightened public opinion is to be brought to bear upon the conduct of governmental affairs.

These studies are wholly descriptive in character. No attempt is made in them to subject the conditions described to criticism, nor to indicate features in respect to which changes might with advantage be made. Upon administrators themselves falls responsibility for making or proposing changes which will result in the improvement of methods of administration. The primary aim of outside agencies should be to emphasize this responsibility and facilitate its fulfillment.

While the monographs thus make no direct recommendations for improvement, they cannot fail greatly to stimulate efforts in that direction. Prepared as they are according to a uniform plan and setting forth as they do the activities, plant, organization, personnel and laws governing the several services of the government, they will automatically, as it were, reveal, for example, the extent to which work in the same field is being performed by different services, and thus furnish the information that is essential to a consideration of the great question of the better distribution and coördination of activities among the several departments, establishments, and bureaus, and the elimination of duplication of plant, organization and work. Through them it will also be possible to

subject any particular feature of the administrative work of the government to exhaustive study, to determine, for example, what facilities, in the way of laboratories and other plant and equipment, exist for the prosecution of any line of work and where those facilities are located; or what work is being done in any field of administration or research, such as the promotion, protection and regulation of the maritime interests of the country, the planning and execution of works of an engineering character, or the collection, compilation and publication of statistical data, or what differences of practice prevail in respect to organization, classification, appointment, and promotion of personnel.

To recapitulate, the monographs will serve the double purpose of furnishing an essential tool for efficient legislation, administration and popular control, and of laying the basis for critical and constructive work on the part of those upon whom responsibility for such work primarily rests.

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THE PANAMA CANAL

ITS HISTORY, ACTIVITIES AND ORGANIZATION

CHAPTER I

HISTORY

"The Panama Canal"[1] is the administrative establishment which exercises control[2] over the maintenance and operation of the Isthmian waterway and its appurtenances both in the Canal Zone and in the United States, including the government of the Canal Zone.[3]

Earlier History. The history of "The Panama Canal," strictly speaking, begins on April 1, 1914, when the provisions of the Panama Canal Act of August 24, 1912 (37 Stat. L., 560), and executive orders of January 27, 1914 (No. 1885), February 2, 1914 (No. 1888), and March 2, 1914 (No. 1897), were put into effect, though the story of the waterway itself may properly be said to have begun before the capture of Constantinople by the Turks in 1453.

The leading Mediterranean trading cities of that time controlled the beaten trade routes to the East and ambitious traders

[1] This title conforms to official usage. Where the term "The Panama Canal" appears in quotations throughout the following pages, reference is to the administrative establishment. Where quotations are omitted the waterway itself is referred to. The title previous to 1914 was the "Isthmian Canal Commission."

[2] Control extends over the so-called "business enterprises," but not over military defense nor the courts. Broadly speaking, the Panama Railroad is included under "business enterprises," but since it is separately incorporated it bears a quasi-independent existence.

[3] A strip of territory included within the boundaries of the Republic of Panama, ten miles in width (five miles on each side of the axis of the canal) running from the Caribbean Sea to the Pacific Ocean, with certain extensions beyond the specified width to include watersheds.

of Spain and Portugal now sought other possible paths. On land the Mediterranean cities monopolized the highways to the Indies and the eyes of the nations facing the Atlantic turned toward water route passages to new fields. By 1486 Bartholomew Dias had sailed as far as the Cape of Good Hope and ten years later Vasco da Gama rounded the Cape and continued to India.

Meanwhile Columbus had undertaken his great adventure and by 1502 had made four voyages to America, on the last of which he explored the coast line of the Isthmus of Panama and portions of Central America.

In 1513 Balboa was sent out with specific instructions to "solve the secret of the strait," and after three weeks of arduous journeying he reached a "peak in Darien" from which he caught his famous glimpse of the "nameless and mysterious ocean." From this time on, the idea of trans-Isthmian travel absorbed numerous explorers and nations, but until the nineteenth century no serious consideration of a canal appears.

The eighteen-hundreds saw repeated attempts along this line, though most of the canal projects which were started (and which failed) during the first half of the century involved the Nicaragua route. Nevertheless, the consummation of an age-long dream was approaching and the timid searchings and attempts of four hundred years were to be culminated by a show of paternalism in the great democracy as vigorous as it was surprising. The completed canal stands to-day, however, as permanent evidence of the success of the anomaly.

The path from 1846 to 1914 was strewn with formidable obstacles; difficulties which tried mens' souls and tested to the limit their initiative and ingenuity.

The Treaty of 1846 between the United States and New Granada granted to the former nation the right to construct means of transit across the Isthmus of Panama, and this concession was translated into action by Aspinwall, Stephens and Chauncey, Americans, who by 1855 had opened the Panama Railroad [4] to traffic.

The Mexican War meanwhile had led to open conflicts of interest between England and America, this being particularly

[4] A line forty-seven miles long connecting Colon (then Aspinwall) on the Atlantic side with Panama City on the Pacific.

true with regard to the contemplated canal route through Nicaragua. The two nations sought relief from the situation, which was becoming acute, by means of a treaty, and in 1850 the Clayton-Bulwer convention was concluded. This treaty marked the entry of the Panama Canal into the domain of modern politics and it was the center of discussions, disputes, and negotiations for some fifty years.

The Civil War diverted attention from the canal, and the years that followed saw little progress toward that goal. In 1869, however, the Suez Canal was opened and the French, successful in that endeavor, turned toward America. Results were not immediate, but by 1883 operations on a major scale had been initiated at Panama by the "Compagnie Universelle du Canal Interoceanique."

The story of French failure—of profligacy, disease, and incompetency—is too well known to demand repetition, but the United States made no real effort to salvage this work, nor indeed, seemingly, to take an active interest in the matter until the Spanish-American War imposed new problems upon the nation.

The spectacular 15,000-mile journey of the battleship "Oregon" around the Horn in order to join the Atlantic Fleet, brought home to the United States the naval need for a canal and the acquisition of extra-continental possessions accentuated it. Events now moved more rapidly.

Definite Steps. The necessary first step toward the acquisition of rights to construct a canal was the modification or abrogation of the Clayton-Bulwer Treaty and after four years of patient negotiation the Hay-Pauncefote Treaty was approved,[5] superseding the convention mentioned.

The Nicaraguan Canal Commission which had been appointed in 1897 (30 Stat. L., 11, 59) made its report in 1899 and was discharged, and Congress in the Rivers and Harbors Bill of 1899 provided for a new commission to make a complete and, if possible, final study of all Isthmian routes, precedent to a decision upon construction.[6] The report of this commission was released on November 16, 1901,[7] a comprehensive document with a degree

[5] November 18, 1901. Proclaimed February 22, 1902.
[6] 30 Stat. L., 1121, 1150; March 3, 1899.
[7] Isthmian Canal Commission, Reports, 1899-1901.

of finality in its findings which left little to be desired so far as facts were concerned. The conclusions, however, did not meet with universal acceptance. The famous "battle of the routes" now ensued, with its surprising reversals of votes in Congress and its profusion of charges and counter-charges. It was terminated by the Spooner Bill, which became law on June 28, 1902 (32 Stat. L., 481), and authorized the President to purchase the rights and property of the French canal company for $40,000,000, secure perpetual control from Colombia of the land necessary for canal use, and proceed with construction.

The French company was quickly outmaneuvered and the rights were purchased but Colombia was more difficult to handle. Indeed, only by the most fortuitous series of events concluded by a bloodless revolution (to which officers of the American, Panaman, and Colombian governments seem to have been privy in advance) was success achieved. With Panama independent progress was smooth and on November 13, 1903, the Hay-Bunau-Varilla Treaty was signed.[8] The path was now cleared for the construction of the canal.

The preceding paragraphs have dealt briefly with a rich and absorbing history, which, fortunately, is available to the interested reader in numerous other and excellent volumes. Neither the scope nor space limitations of this monograph permit of a more extensive review of the period prior to 1904 and the same is true as to the story of canal construction, that is, the ten years from 1904 to 1914.

With regard to this interesting and important period an embarrassing plethora of material exists, both in book form and in current articles. The construction of the Panama Canal stands as one of the foremost engineering feats of all times, and volumes are available which describe the work in detail from both the lay and the technical standpoints.

This monograph, therefore, will pass over the absorbing events of construction days; the early battle with yellow fever and malaria; the bewildering succession of commissions and chairmen; the heroic struggle against the great slides; the transition from

[8] The *de facto* government of Panama was recognized by the United States on November 7. Independence had been declared on November 3.

democratic control to benevolent despotism; and the contest of the experts as to sea-level or lock canal. So, too, mere mention must suffice for the story of the prodigious energy and remarkable technique which completed the canal with an economy of time, money, and lives, surpassing the most optimistic forecasts; an enduring monument to American enterprise.

While the opening of the canal did not come until August 1914,[9] preparation therefor in the way of legislation had begun as early as 1912, since by that time construction had progressed to the point where a completion date was predictable.

Panama Canal Act. The transition from construction to operation required numerous and fundamental readjustments in organization, preceded of course by adequate authority of law and executive order. The first and most important piece of legislation came on August 24, 1912—the Panama Canal Act (37 Stat. L., 560)—"An Act To provide for the opening, maintenance, protection and operation of the Panama Canal, and the sanitation and government of the Canal Zone."[10]

This law, since it forms the foundation upon which the entire super-structure of "Canal" administration is erected, demands discussion in some detail.

Territory. Section 1 of the act (p. 560) specifies the limits of the territory over which the United States is to maintain jurisdiction. This is defined as a zone of land and land under water ten miles in width,

> . . . extending to the distance of five miles on each side of the center line of the route of the canal . . . which zone begins in the Caribbean Sea three marine miles from mean low-water mark and extends to and across the Isthmus of Panama into the Pacific Ocean to the distance of three marine miles from low-water mark, excluding therefrom the cities of Panama and Colon, and their adjacent harbors located within said zone, as excepted in the treaty with the Republic of Panama . . . but including all islands within said described zone and in addition thereto the . . . islands . . . named Perico, Naos, Culebra and Flamenco and *any*

[9] The irony of the fact that this canal, perhaps the greatest constructive enterprise of all time, was thrown open to the world almost coincidently with the outbreak of the most devastating war in history is obvious.

[10] For full text of act see Appendix 5, *post*.

lands and waters outside of said limits above described which are necessary or convenient or from time to time may become necessary or convenient for the construction, maintenance, operation, sanitation or protection of the said canal[11] or of any auxiliary canals, lakes, or other works necessary or convenient for the construction, maintenance, operation, sanitation or protection of said canal, the use, occupancy, or control whereof were granted to the United States by . . . treaty . . .

The zone so described was designated by the act as the "Canal Zone" and the canal as "The Panama Canal," thus fixing these titles legally.

The act obviously gave considerable leeway for the extension of the Canal Zone as necessity dictated, the section in italics bearing upon this point. The power was further amplified in the same section, as follows:

The President is authorized by treaty with the Republic of Panama to acquire any additional land or land under water not already granted, or which was excepted from the grant, that he may deem necessary for the operation, maintenance, sanitation or protection of the Panama Canal and to exchange any land or land under water not deemed necessary for such purposes for other land or land under water which may be deemed necessary for such purposes, which additional land or land under water so acquired shall become part of the Canal Zone.

Existing Laws Continued. The new act in Section 2 provided for the confirmation of "all laws, orders, regulations and ordinances" already in force until such time as Congress might change them by new legislation, while existing courts were permitted to continue until the courts provided for in the new law[12] could be established.

Courts. Provision was made for the establishment of a magistrate court in each town, the geographical limits of authority for such courts being coextensive with those of the town. Such courts held original and exclusive jurisdiction over all

. . . civil cases in which the principal sum claimed does not exceed three hundred dollars and all criminal cases wherein the

[11] Italics not in original.
[12] Secs. 7 and 8, pp. 564, 565.

punishment . . . imposed shall not exceed a fine of one hundred dollars, or imprisonment not exceeding thirty days, or both . . .

These courts also had jurisdiction over violations of police regulations and ordinances and "actions involving possession or title to personal property or the forcible entry and detainer of real estate," while the magistrates were required to hold preliminary investigations on certain charges.

A district court was also established, with two divisions and one judge for each division. The rules of practice for this court as well as the magistrate courts were left to order of the President for prescription or amendment.

Land Titles. Land titles were taken up in the third section of the act (p. 561), the President being empowered to declare all land in the Zone necessary for canal purposes, thus extinguishing private title. Provision was made for appeal and adverse claims under the treaty with Panama.

Organization. Drastic changes in the organization of canal administration were authorized by the law. The President was empowered, within his judgment, to discontinue the Isthmian Canal Commission, abolishing with it the organization as it existed at the time the law was passed. The act said:

. . . the President is authorized . . . to complete, govern and operate the Panama Canal and govern the Canal Zone, or cause them to be completed, governed and operated through a governor of the Panama Canal and such other persons as he may deem competent to discharge the various duties connected with the completion, care, maintenance, sanitation, operation, government and protection of the canal and Canal Zone.

The governor of "The Panama Canal" was to be appointed by the President, with advice and consent of the Senate, for a term of four years "and until his successor shall be appointed and qualified," at a salary of ten thousand dollars per annum. Other employees were to be appointed and removed by the President or by his authority. Salaries were not permitted to exceed by more than 25 per cent the rates paid for similar work in the United States.

The same section of the act also directed the President to arrange for the formal opening of the canal upon its completion

and provided for a report from the Commission of Arts, previous to the completion of the canal, upon the architectural design of the structures to be erected in the Zone. This report was to be submitted to Congress through the President.

Tolls. Section 5 of the act (p. 562) gave the President power to prescribe and change the tolls for vessels using the Panama Canal, but provided for the exemption from tolls of vessels engaged in the coastwise trade.[13]

This section also amended Section 4132 of the Revised Statutes, specifying what vessels were eligible for American registry. The revision included vessels built within the United States and owned wholly by citizens thereof, prizes of war and legally forfeited vessels, and vessels not more than five years of age wherever built, but owned by American citizens and not engaged in coastwise trade.

Duties on foreign yachts were provided for, the free admission to the United States of shipbuilding materials was specified, and conditions for ocean postal contracts were outlined.

Section 5 also laid down the basis for tolls, including ships in ballast. A maximum toll based on net registered tonnage was also provided for.[14]

This section further provided for the operation of the canal as follows:

> The President is authorized to make, and from time to time amend, regulations governing the operation of the Panama Canal, and the passage and control of vessels through the same or any part thereof, including the locks and approaches thereto, and all rules and regulations affecting pilots and pilotage in the canal or the approaches thereto through the adjacent waters.

Provision was also made for the payment of claims for damage to vessels and, under a schedule of compensation, for the payment of claims of injured employees.

Section 6 (p. 563) authorized the erection of radio stations in the Zone, as well as on Panama territory, gave official messages

[13] This provision was repealed by Section 1 of the act of June 15, 1914 (38 Stat. L., 385).

[14] This sentence was amended by Section 2 of the act mentioned (38 Stat. L., 385), which inserted a proviso eliminating the waiver of rights under the Hay-Pauncefote and Hay-Bunau-Varilla treaties with regard to exempting United States vessels from tolls.

precedence, and permitted agreements with private radio companies. Provision was also made for the establishment, maintenance and operation of dry-docks, repair-shops, yards, docks, wharves, coaling and oil stations, etc., for use both by government and privately owned vessels.

Civil Government. With regard to the government of the Canal Zone Section 7 (p. 564) provided as follows:

> . . . the Governor of the Panama Canal shall, in connection with the operation of such canal, have official control and jurisdiction over the Canal Zone and shall perform all duties in connection with the civil government [15] of the Canal Zone which is to be held, treated and governed as an adjunct of the Panama Canal.

Existing laws applicable to the Governor and civil administration were held to be still in force and the President was authorized to determine what towns and political subdivisions should be established in the Zone.

Sections 8 and 9, as previously noted, dealt with the courts, while Section 10 (p. 566) provided penalties for those violating rules and regulations of the Governor in respect to trespassing upon the Zone.

Interstate Commerce Regulations. Section 11 (p. 566) was devoted to the amendment of certain sections of the interstate commerce laws and regulations, the classification of powers and specification of duties and jurisdiction of the Interstate Commerce Commission, and the definition of terms.

Extradition. Section 12 (p. 569) provided for extension to the Canal Zone of all existing laws and treaties relating to extradition.

War Powers. In time of war or threatened war the act (Section 13, p. 569) provided for the complete subordination of the civil administration of the Zone to military authority, in the person of an Army officer to be appointed by the President.

Executive Orders. While the basic authority for the permanent organization of "The Panama Canal" lay in the act just described, it remained for executive order to put it into effect; that is, the date of initiating the exercise of the powers granted

[15] Although various areas have been set apart by executive order for military and naval use, such areas are proclaimed as subject to civil jurisdiction.

to the President was left to his discretion. With the early completion of construction assured, President Wilson on January 27, 1914, issued the reorganizing order (Executive Order 1885), which bore the title "To Establish a Permanent Organization for The Panama Canal." As the official description of the structure of permanent organization it deserves quotation in full:

By virtue of the authority vested in me, I hereby enact the following order, creating a permanent organization for the Panama Canal, under the Act of Congress "To provide for the opening, maintenance, protection and operation of the Panama Canal and the sanitation and government of the Canal Zone," approved August 24, 1912.

SECTION 1. The organization for the completion, maintenance, operation, government and sanitation of the Panama Canal and its adjuncts and the government of the Canal Zone shall consist of the following departments, offices and agencies, and such others as may be established by the Governor of the Panama Canal on the Isthmus or elsewhere with the approval of the President, all to be under the direction of the Governor, subject to the supervision of the Secretary of War.

DEPARTMENT OF OPERATION AND MAINTENANCE

There shall be a Department of Operation and Maintenance under the immediate supervision, and direction of the Governor of the Panama Canal. This Department shall be charged with the construction of the Canal and with its operation and maintenance when completed, including all matters relating to traffic of the Canal and its adjuncts, and the operation and maintenance of beacons, lights and light-houses; the supervision of ports and waterways, including pilotage; the admeasuring and inspecting of vessels, including hulls and boilers; the operation and maintenance of the Panama Railroad upon the Isthmus, including telephone and telegraph systems; the operation of locks, coaling plants, shops, dry-docks and wharves; office engineering, including meteorology and hydrography; the construction of buildings and sanitary and municipal engineering, including the construction and maintenance of drainage ditches, streets, roads and bridges.

PURCHASING DEPARTMENT

There shall be a Purchasing Department under the supervision and direction of the Governor. This department shall be charged with the purchase of all supplies, machinery or necessary plant.

SUPPLY DEPARTMENT

There shall be a Supply Department, under the supervision and direction of the Chief Quartermaster. This department shall store and distribute all material and supplies for use of the Panama Canal and of its employees; and for other departments of the Government on the Isthmus and their employees; and for vessels of the United States and for other vessels, when required. The Supply Department shall operate commissaries, hotels and messes; shall be in charge of the maintenance of buildings, the assignment

of quarters and the care of grounds; shall recruit and distribute unskilled labor; and shall have charge of the necessary animal transportation.

Accounting Department

There shall be an Accounting Department under the supervision and direction of the Auditor, with an assistant in the United States. The duties of the department shall include all general bookkeeping, auditing and accounting, both for money and property, costkeeping, the examination of payrolls and vouchers, the inspection of time books and of money and property accounts, the preparation of statistical data, and the administrative examination of such accounts as are required to be submitted to the United States Treasury Department; and the collection, custody and disbursement of funds for the Panama Canal and the Canal Zone. These same duties shall be performed for the Panama Railroad Company on the Isthmus when not inconsistent with the charter and by-laws of that company. The department shall be charged with the handling of claims for compensation on account of personal injuries and of claims for damages to vessels. Within the limits fixed by law, the duties and financial responsibilities of the officers and employees charged with the receipt, custody, disbursement, auditing and accounting for funds and property shall be prescribed in regulations issued by the Governor, with the approval of the President. The Auditor shall maintain such a system of bookkeeping as will enable him to furnish at any time full, complete and correct information in regard to the status of appropriations made by Congress, the status of all other funds, and the amounts of net profits on all operations, which are to be covered into the Treasury as required by the Panama Canal Act.

Health Department

There shall be a Health Department under the supervision and direction of the Chief Health Officer. This department shall be charged with all matters relating to maritime sanitation and quarantine in the ports and waters of the Canal Zone and in the harbors of the cities of Panama and Colon, and with land sanitation in the Canal Zone, and sanitary matters in said cities in conformity with the Canal Treaty between the United States and the Republic of Panama and existing agreements between the two governments thereunder, and all matters relating to hospitals and charities.

Executive Secretary

There shall be an Executive Secretary who, under the direction of the Governor of the Panama Canal, shall be charged with the supervision of all matters relating to the keeping of time of employees; to postoffices, customs, taxes and excises, excepting the collection thereof; police and prisons; fire protection; land office; schools, clubs and law library; the custody of files and records; and the administration of estates of deceased and insane employees. He shall, in person or through one of his assistants, perform the duties of a Shipping Commissioner. He shall conduct all correspondence and communications between the authorities of the Canal Zone and the Government of the Republic of Panama and such other correspondence as may be given him in charge by the Governor. He shall have charge of the seal of the Government of the Canal Zone and shall attest

such acts of the Government as are required by law to be performed and done under the seal.

The duties herein prescribed for the foregoing departments, offices and agencies will be assigned to divisions or bureaus thereunder by the Governor of the Panama Canal, as the necessities therefor arise. Each of the foregoing departments shall discharge such further duties as may be assigned to it from time to time by the Governor; and the Governor, with the approval of the President, may transfer from time to time specific duties from one department to another.

SECTION 2. The organization provided for in Section 1 shall be, in general, in accordance with the outline chart accompanying the memorandum of January 27, 1914, entitled, "Memorandum to accompany Executive Order of January 27, 1914, providing for a permanent organization for the Panama Canal," and officers from certain departments shall be detailed in accordance with that memorandum.

SECTION 3. This order shall take effect from and after the 1st day of April, 1914, from which date the Isthmian Canal Commission, together with the present organization for the Panama Canal and the Canal Zone, shall cease to exist, in accordance with the terms of the above-mentioned Act of Congress.[16]

Another order (No. 1888) was issued on February 2, 1914, "Providing Conditions of Employment for the Permanent Force for the Panama Canal." Though it did not deal with organization matters, this order provided the basis of employment under which the personnel of the new organization would work. It dealt successively with appointment and compensation, transportation of employees to and from the United States, quarters, medical care, leave regulations, including annual, cumulative, and travel leave, and office hours and hours of labor.

[16] This order was accompanied by a memorandum amplifying and explaining it. It read as follows:

(Memorandum to accompany Executive Order of January 27, 1914, providing for a permanent organization for the Panama Canal)

In construing and carrying out the foregoing order, I direct that it be done with the following considerations in view:

I have deemed it advisable for reasons of efficiency, economy and good administration to have all the activities connected with the Panama Canal under the supervision of one Cabinet officer.

The troops which will be stationed on the Canal Zone for the protection of the Panama Canal are under the Secretary of War; the Panama Canal Act provides that in time of war an Officer of the Army shall upon the order of the President have exclusive authority over the operation of the Panama Canal and the Government of the Canal Zone; the construction of the Canal has been successfully carried on under the supervision of the Secretary of War; the logical conclusion is, therefore, that the supervision

On March 2, 1914, another important executive order (No. 1897) was issued "To establish a Washington Office of the Panama Canal, to provide temporarily for the organization, officials and employees thereof, and to continue in force The Panama Canal rules, regulations and executive orders which may have been made for the Isthmian Canal Commission."

The provisions of this order, which continued permanently the operation of one of the major divisions of "The Panama Canal," read as follows:

By virtue of the authority vested in me it is hereby ordered:

SECTION I. That an office of The Panama Canal is established in the City of Washington in the District of Columbia.

SEC. II. That the Washington Office of The Panama Canal shall be the office of general records in the United States, and shall succeed to the custody, care and preservation of all the records and files of the Isthmian Canal Commission, to be retained and preserved in the United States on and after April 1, 1914, and shall also succeed to and become chargeable with all property of every kind and character purchased for the Washington Office of the Isthmian Canal Commission, which is on hand April 1, 1914.

SEC. III. That the Washington Office of The Panama Canal shall be the headquarters and the principal office of the Purchasing Department of The Panama Canal. The head of the Purchasing Department of The

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of the operations of the Panama Canal under the permanent organization should be under the Secretary of War.

It is directed that officers shall be detailed for certain duties from the several departments as follows:

As Engineer of Maintenance an Officer of the Corps of Engineers, U. S. Army, who shall act as Governor in the absence or disability of the Governor of the Panama Canal.

As Superintendent of Transportation, an Officer of the U. S. Navy.

As Electrical Engineer, an Officer of the Corps of Engineers, U. S. Army.

As Captains of the Terminal Ports, Officers of the U. S. Navy.

As Superintendent of Shops and Dry Docks, a Naval Constructor, U. S. Navy.

As Chief Health Officer, an Officer of the Medical Corps, U. S. Army.

As Superintendent of Hospitals, an Officer of the Medical Corps, U. S. Army.

As Chief Officer of the Quarantine Division, an Officer of the U. S. Bureau of the Public Health.

As Chief Quartermaster, an Officer of the Quartermaster Corps, U. S. Army.

The organization is to be in general accordance with the chart accompanying this memorandum, except that all of the various divisions and subdivisions need not be established until in the opinion of the Governor it is desirable to do so, the organization being expanded gradually as the necessities of the work require.

Panama Canal, under the direction of the Governor, shall have administrative control of the Washington Office of The Panama Canal. He shall be subject to orders and supervision of the Chief of Engineers of the U. S. Army to such extent as may be directed by the Secretary of War. He shall be General Purchasing Officer for The Panama Canal, and shall also act as the Chief of the Washington Office of The Panama Canal.

SEC. IV. That until further ordered, the Washington Office of The Panama Canal shall have the same organization as to offices and departments (except the Office of the Assistant Examiner of Accounts and the Disbursing Office) as the Washington Office of the Isthmian Canal Commission shall have on March 31, 1914. The number, class and salaries of officials and employees in each of the offices and departments, except as hereinafter provided, shall be the same as those authorized for the Washington Office of the Isthmian Canal Commission on March 31, 1914, and any change in the salary of any position, or in the number of positions in any office or department, shall be made only as now provided by law. The officers and employees, except as hereinafter provided, shall perform the same class of duties that they may be assigned to on March 31, 1914.

SEC. V. That the Assistant Auditor provided for in Executive Order No. 1885, dated January 27, 1914, shall be appointed April 1, 1914. His salary shall be fixed by the Governor. He shall perform such duties of the Accounting Department to be performed in United States, as may be assigned to him by the Auditor, and also such other duties of a general nature as may be assigned to him by the Chief of the Washington Office of The Panama Canal.

On and after April 1, 1914, there shall be transferred to the Assistant Auditor, and he shall be charged with the custody, care and preservation of, all records and property of the Disbursing Officer, and of the Assistant Examiner of Accounts of the Isthmian Canal Commission, with which those officers shall be charged on March 31, 1914.

The Chief of the Washington Office may, however, transfer to and place in the custody of the Disbursing Clerk, hereinafter provided for, such of the property and records above described, as he may deem to be essential to enable the Disbursing Clerk to properly perform his duties under this order, but the Disbursing Clerk shall not be permitted, without specific authority from the Chief of Office, to keep a separate set of records and files. He shall be required to rely upon, and consult when necessary, the records and files in the office of the Assistant Auditor, in verifying the legality of claims and accounts submitted to him for payment, or to verify the details of any collections for which he is required to account. Disbursements will be made by the Disbursing Clerk only after examination of the claim on account in the office of the Assistant Auditor.

Such of the officers and employees employed in the office of the Assistant Examiner of Accounts and the Disbursing Office of the Isthmian Canal Commission on March 31, 1914, as the Governor determines to retain, shall be transferred to and employed in the Accounting Department in the United States, and their salaries fixed at such amount as the Governor deems just and reasonable.

There shall be a Disbursing Clerk for that part of the Accounting Department in the United States, who shall perform similar duties to those that are required to be performed by the Collector and Paymaster on the Isthmus, in so far as there are such duties to be performed in the United

States, and shall be subject to the same supervision by the Assistant Auditor, as the Collector and Paymaster on the Isthmus are by the Auditor. He shall give bond in such amount as may be fixed by the Governor, or by his authority.

Such of the officers and employees as are transferred to and employed in the Accounting Department in the United States, shall be distributed between the office of the Assistant Auditor and that of the Disbursing Clerk, respectively, as the needs of the service require. They shall perform such duties as may be assigned to them by proper authority. They shall be subject to similar financial responsibilities, and to the same general rules and regulations that have been prescribed for like officers and employees employed in the Accounting Department on the Isthmus.

It is the purpose of this order, and it shall be so construed, as to require the Assistant Auditor of The Panama Canal to examine all claims and accounts before their payment by the Disbursing Clerk; to carry on all general correspondence in relation to claims and accounts required to be conducted by the Accounting Department in the United States; to prepare all vouchers and certify to the validity of all claims and accounts before they are submitted to the Disbursing Clerk for payment; to furnish to the Disbursing Clerk all necessary data to enable that officer to make reply to any exceptions that may be taken to his account by the Auditor for the War Department; to keep all general records required to be kept in the Accounting Department in the United States; to make all reports as to statistical data required to be sent to the Auditor on the Isthmus; to give an administrative examination to all accounts of the Disbursing Clerk before they are transmitted to the Auditor; to make an administrative examination of all claims which are to be submitted to the Auditor for direct settlement; to keep a complete record of all collections to be made and all moneys received by the Disbursing Clerk; to certify to the correctness of the Disbursing Clerk's accounts for collections; to see that bills collectible are issued and collections made in all proper cases; to have charge of all general files which are required to be kept by the Accounting Department in the United States; and to perform such other duties as may be assigned to him by the Auditor, or the Chief of the Washington Office.

SEC. VI. That any person holding appointment or employment in or under the Washington Office of the Isthmian Canal Commission on March 31, 1914, shall be eligible for appointment to, or employment in a like position in or under the Washington Office of The Panama Canal, created by this order, and all except those employed in the Accounting Department, will be considered to be transferred and appointed to such like position in or under the Washington Office of The Panama Canal, as of April 1, 1914, without further order or appointment. The oath of office shall be taken by all officials and employees of the Washington Office.

SEC. VII. This order shall remain in force as a provisional order only, for the establishment of the Washington Office of The Panama Canal, until an order for the permanent organization of such office shall have been made.

SEC. VIII. All rules, regulations and executive orders, not inconsistent with the provisions of this order and the executive orders of January 27, and February 2, 1914, heretofore made for the Isthmian Canal Commission, and applicable to conditions that will exist under these orders, shall be and are hereby continued in full force and effect, as rules, regulations, and

executive orders for the government of officers and employees of The Panama Canal and the transaction of the business of The Panama Canal.

These were the basic enactments from which the permanent organization of "The Panama Canal" was developed. The actual detailed changes, however, occurred from time to time during the fiscal year 1914, as the termination of the construction period approached. They followed a general process of retrenchment and consolidation.

The Permanent Plan Initiated. On April 1, 1914, the existing organization of the Isthmian Canal Commission was abolished and the new one contemplated by the Panama Canal Act put under way.

The executive order of January 27, 1914 (No. 1885), placed under the control of the Governor the task of completing the remaining construction work on the canal, of maintaining and operating the canal after it was open to traffic, and of administering the civil government of the Canal Zone. In order to carry out the work major organization units were established [17] as follows:

1. Department of Operation and Maintenance
2. Purchasing Department
3. Supply Department
4. Accounting Department
5. Health Department
6. Executive Office
7. The Panama Railroad

The Department of Operation and Maintenance was made directly responsible to the Governor, who in this capacity acted as head of the Department. The Department itself was subdivided into three main groupings reporting respectively to the head of the Department direct, to the Engineer of Maintenance, and to the Superintendent of Transportation. The first two groups re-

[17] This specification of departments or officers followed the requirements of the executive order of January 27, 1914 (No. 1885). The Annual Report of the Isthmian Canal Commission for 1914, however (p. 3), lists the Washington Office as a separate unit, making seven in all. On the other hand, the general organization chart (plate 137) accompanying the Annual Report for 1914 shows the Washington Office and Purchasing Department together as a single unit. This would total six, but the Panama Railroad is added as a coördinate division of the organization to make seven.

ceived no designating name. The third was called the Division of Canal Transportation.[18]

The Engineer of Maintenance and the Superintendent of Canal Transportation were assistants to the Governor in his capacity as head of the Department of Operation and Maintenance.

The group of units directly under the heads of the Department consisted of five divisions: the Dredging Division, under a resident engineer; Division of Terminal Construction, under an engineer of terminal construction; Mechanical Division, under a superintendent; Fortification Division, under an assistant engineer, and a Division of General Construction reporting directly to the Governor as head of the Department.

The Division of Terminal Construction was given control over the design, inspection, and construction of dry docks, shops, coaling and fuel-oil plants, floating cranes, and docks and other terminal facilities; transportation of construction materials by railroad; street and sewer work at Balboa; and breakwater construction at the Atlantic terminal.

The duties of the Dredging, Fortification, and Mechanical divisions were indicated by their names, while the miscellaneous construction directly under the Governor included sluicing in the vicinity of Gold Hill, completion of Naos Island Breakwater, excavation in the dry to relieve side pressure near Culebra, and the grading and filling at the locks and dams.

The Engineer of Maintenance had under his supervision four organization units: the Division of Municipal Engineering, under a resident engineer; the Electrical Division, under an electrical engineer; the Division of Erection, under an electrical and mechanical engineer; and the office organization, including the office engineer, the work in meteorology and hydrography under a chief hydrographer, and general surveys under an assistant engineer.[19]

The Division of Canal Transportation, under a Superintendent of Transportation, was composed of four offices or organization units. These included the Captain of the Port of Balboa, the Captain of the Port of Cristobal, the Board of Admeasurers

[18] This was later changed to Marine Division, and the title Superintendent of Canal Transportation, to Marine Superintendent.

[19] The Division of Lighthouses, also under the engineer of maintenance, was abolished on June 16, 1914.

and the Board of Local Inspectors, each board consisting of three members. The Division as a whole was charged with the safe conduct of vessels through the canal.[20]

The Supply Department, the second of the main organization units reporting directly to the Governor, resulted from the consolidation of the previously existing Quartermasters and Subsistence departments and was placed under the direction of a Chief Quartermaster. The duties and responsibilities of this department were as follows:

> It has charge of the storing and distribution of all material and supplies for use of The Panama Canal and its employees, and for other departments on the Isthmus and their employees, and for vessels of the United States and other vessels when required. It operates commissaries, hotels, and messes; has charge of the maintenance of buildings, the assignment of quarters, and care of grounds. It recruits and distributes unskilled labor and is in charge of the necessary animal transportation.[21]

The Accounting Department was composed of three offices,[22] the auditors, the paymasters, and the collectors and was placed under the direction of an auditor.

The consolidation above mentioned was made primarily to effect administrative economies, the heads of the subordinate offices being given independence on the technical side of their respective spheres of work.

The Accounting Department was charged with the duties of general bookkeeping, auditing and accounting for both money and property, the examination of payrolls and vouchers, inspection of time books and of money and property accounts, the administrative examination of accounts as required by law, and the collection, custody, and disbursement of funds for "The Panama Canal" and the Canal Zone.

[20] Although the text failed to mention it (Isthmian Canal Commission, Annual Report, 1914, p. 3), the organization chart accompanying the Annual Report for 1914 (plate 143) presented the Lighthouse Service as a fifth coördinate subdivision reporting directly to the Superintendent of Transportation.

[21] Annual Report, 1914, p. 4.

[22] Here again, the text so describes the organization (*ibid.*), but the organization chart (plate 145) displays a fourth coördinate unit called "Washington Office."

The three main sub-divisions mentioned [23] consisted of the Division of Disbursements, under a paymaster; the Division of Accounts, responsible directly to the Auditor; and the Division of Receipts, supervised by a collector.

The Health Department, under a Chief Health Officer, was composed of three divisions: Health and Charities, Quarantine, and Sanitation. The Quarantine Division was directed by a Chief Quarantine Officer, responsible to the Chief Health Officer, but the subordinate units of the other two divisions reported directly to the Chief Health Officer.

The Department was responsible for all matters concerning maritime sanitation and quarantine in ports and waters of the Canal Zone and in the harbors of the cities of Panama and Colon; also for land sanitation in the Canal Zone and problems of sanitation in the cities.[24] All duties related to hospitals and charities also came under this department.

The Executive Department was placed under the direct control of the Governor, aided by the District Attorney, a special attorney, a special secretary, and the Executive Secretary.

The District Attorney's office performed the legal functions usual to such an office while that of the Special Secretary looked after the publication of the Canal Record and other matters which the Governor might assign, such as the investigation of complaints and certain inspections.

The Special Attorney's Office was "charged with the purchase, under the Governor's direction, of the land within the Canal Zone, necessary for the construction, maintenance, operation, sanitation or protection of 'The Panama Canal' and shall represent the Government before the Joint Land Commission or other courts of tribunal in the settlement of land or property claims or claims against the Government for damage to or destruction of private property." [25] This office was also charged with the duty of codifying the various laws, executive orders, and ordinances affecting the Canal Zone.

The principal work of civil administration came under the jurisdiction of the Executive Secretary and was organized under six

[23] See note 22.
[24] In conformance with the treaty between Panama and the United States.
[25] Governor's Circular, 660, p. 10.

distinct heads.[26] These included the Executive Office, the Divisions of Civil Affairs, Police and Fire, Schools, and Posts, and the extra-departmental activities.

The Executive Office, directly under the Executive Secretary, constituted the general business office of the Governor and was composed of six subordinate bureaus: Clerical, under a chief clerk; Personnel, under a clerk-in-charge; Timekeeping, under a chief timekeeper; Cost-keeping, under a cost accountant; Clubs and Playgrounds, under a superintendent; and a general bureau which included a surveying officer, a photographer, an inspector, and the private secretary to the Governor.

The Division of Civil Affairs, under a chief of division, was concerned with three main lines of activity: the issuance of licenses, except those issued by the board of local inspectors, the conduct of all matters relating to the customs service, and the administration of estates of deceased and insane employees.

The Police and Fire Division, under a chief, was charged with the usual functions of caring for the public safety; that is, maintenance of peace and order, enforcement of laws, care and custody of prisoners, and fire inspection, prevention, and protection. The chief also acted as coroner of the Canal Zone and warden of the penitentiary.

The Division of Schools, under a superintendent, followed the normal organization plan and bore the usual responsibilities of a public education system.

The Division of Posts, under a director, was charged with the duty of administering the affairs of the Canal Zone postal system and with transacting business with other postal systems.

The extra-departmental activities included the district court and the magistrate courts.

The Panama Railroad, which has here been considered as one of the seven coördinate departments of "The Panama Canal," was organized along the usual railroad lines, with a board of directors and a president and with the vice-presidents responsible for certain subdivisions of the work.

[26] The organization chart (plate 138) and the text (Annual Report, 1914, p. 4) differ once more, the former listing but five main units, omitting the Division of Posts.

This, then, was the type of organization which was established during the transition period of "The Canal" to handle the termination of construction and to function, if possible, for the permanent operation and maintenance of the canal and the government of the Canal Zone.[27]

Nothing of moment is recorded between the initiation of the new organization on April 1, 1914, and the opening of the canal to traffic three months later. The completion of the construction essential to the passage of ships through the canal was accomplished in conformance with schedule and estimates, and by August all was ready.

The Period of Operation. The great task had now reached a successful conclusion, and although certain details of construction remained to be completed the Panama Canal was opened to traffic on August 15, 1914. At 8:06 a. m., on that day the steamship "Ancon" entered the Gatun Locks, and was locked through in one hour and nine minutes. The passage across Gatun Lake and through the Cut consumed over three hours and a half, the ship entering Pedro Miguel Lock at 12:51. This lockage took but twenty-eight minutes, while those at Miraflores consumed one hour and twenty-eight minutes. At 3:23 p. m., the transit of the canal by the first commercial vessel had been completed and the ship passed out into the Pacific. After four hundred years of waiting trans-Isthmian travel by water had at last been accomplished.

A brief review of the progress of a ship through the canal as it appears to-day may be of service at this point in showing the relation of various features and lending clarity to later discussion of maintenance and operation.

The vessel approaches the canal entrance between the breakwaters in Limon Bay, an arm of the Caribbean Sea, and heads due south through a channel dredged for some two-thirds of its length in the bay, and for the rest cut through the land. The channel, $6\frac{2}{3}$ miles in length, 500 feet in width, and 41 feet in depth at mean tide, leads directly to Gatun Locks.

[27] The executive order of May 20, 1914 (No. 1944), provided for a committee of six members to arrange suitable ceremonies for the formal and official opening of the canal. The committee was composed of members of the Isthmian Canal Commission.

This flight of locks is composed of three steps of twin chambers, each chamber having usable dimensions of 1000 feet in length, 110 feet in width, and 70 feet in depth. The chambers being in pairs, ships may be passed in opposite directions at the same time.

Gatun Locks are 6330 feet in length. The lock walls vary from 50 to 81 feet in height, the center wall being 60 feet in thickness. In recesses and tunnels of these walls are housed the culverts and operating mechanism of the lock-gates and protective appurtenances.[28] The operating gates are in pairs, each leaf measuring 65 feet in length, 7 feet in thickness, and varying in height from 64 feet 8 inches to 82 feet.[29] The leaves come together in the form of an inverted "V," with the apex resting against the head of water. The leaves vary in weight from 390 to 730 tons.

The total lift of these locks from sea-level to lake level averages 85 feet, approximately one-third the distance being cared for by each step.

The vessel upon leaving Gatun Locks enters Gatun Lake, the largest artificial lake in the world, with a surface area of 164 square miles and a water-shed area of 1320 square miles. This lake, formed by the construction of Gatun Dam[30] just west of Gatun Locks, supplies "The Canal" with water for all purposes.

The channel in Gatun Lake varies in width from 500 to 1000 feet, bearing directly south from the locks for some 5 miles and then southeast and east to Gaillard Cut.[31] The depth varies from 45 to 85 feet in both lake and cut.

The course through the lake is marked by buoys, range lights and markers, and signals for both day and night use, though navigation at night has not yet become necessary.[32] The lake section of the channel is about twenty-four miles in length.

Upon entering Gaillard Cut which carries the canal through the

[28] That is, guard gates and fender chains.

[29] The guard gates are 47 feet 4 inches in height.

[30] An earth and rock dam, 1½ miles long, and one-half mile thick at the bottom, tapering to 100 feet at the top, which rises 105 feet above sea level (20 feet above average lake level). The dam contains almost 23 million cubic yards of fill.

[31] In crossing the lake there are six decided bends in the channel, but the course in general is approximately ESE.

[32] The canal is assumed to be adequately marked and lighted for night transits, and the regulations forbid the use of search lights by vessels in the canal.

continental divide, the channel narrows to 300 feet,[33] and swings almost due east to Gamboa, where it resumes the general southeasterly trend. The Cut is a little less than nine miles in length, the bottom being 40 feet above sea level.[34] It leads directly to Pedro Miguel Lock, a single step with twin chambers,[35] lowering the vessel from the elevation of Gatun Lake (+85) to that of Miraflores Lake (+54).

Miraflores Lake, an artificial body of water formed by a dam, is approximately a mile in length and has an area of 1.6 square miles. It carries the channel, 500 feet in width, from Pedro Miguel to Miraflores Locks,[36] the latter, in two steps (of twin chambers) lowering the vessel to sea level.

The channel[37] from this point leads past Balboa into the Bay of Panama, a distance of eight miles.

The total canal journey is approximately forty-two miles,[38] requiring an average transit time of eight hours. The material involved in channel and structures necessary to transit ships includes forty-six gates with ninety-six leaves and a total weight of 60,000 tons, 4,500,000 cubic yards of concrete and a total of over 357½ million cubic yards of excavated earth and rock.

The huge scars of construction days have disappeared. Gatun Dam, now covered with vegetation, has become a natural part of the landscape, one wing forming the site for a nine-hole golf course. The locks, once towering structures of concrete, now show smooth sodded shoulders at canal level.

Ships pass through almost in silence. The swish of water filling the lock chambers, the hum of towing-locomotive motors, a signal gong now and then are all that is heard.

Gatun Lake has covered the remains of scattered villages, small forests, and valleys full of rank tropical vegetation and the turbulent Chagres dissipates its energy in this broad lagoon.

[33] Bottom width, varied by bays cut into the channel to help control the slides. The width across the cut between the upper edges of the slides at the widest point is about 3000 feet. The channel widens to 600 feet approaching Pedro Miguel Lock.

[34] Giving an average minimum depth of 45 feet.

[35] The dimensions of chambers, walls and gates is the same, generally speaking, for all locks. Pedro Miguel is 4376 feet long over all.

[36] 5456 feet in length. These locks have extra depth because of tidal variations.

[37] Width 500 feet, depth 45 feet.

[38] Fifty miles from deep water in one ocean to deep water in the other.

The placid passage of a vessel through the canal reveals little evidence of the strenuous construction battles which made the transit possible. Only in Gaillard Cut do the scars still show. There bare and frowning cliffs stand as reminders of a mighty struggle that may be renewed at any time.

This recital has outlined the canal transit of to-day, and, in all essentials that of August 15, 1914. But while operation was successfully under way in 1914, construction activities continued for some time after transits had been initiated. The story of these construction activities is an essential part of the history of the operating period of "The Canal," which falls naturally into three divisions.

The first of these sub-periods covers the fiscal years before the United States entered the war, that is, when the canal bore the status of an international water-route under control of a neutral nation (1915-17); the second period includes the years during which the United States was a belligerent (1918-19); and the third involves the period of normal operation (1920-1926).

The Pre-war Years. The pre-war fiscal years 1915, 1916, and 1917 constituted a severe trial period for transit operations. The canal was opened to traffic while numerous auxiliary construction projects were still under way and the slides at Gaillard Cut displayed discouraging persistence. The situation during these years is briefly outlined below.

Organization. The completion of the new administration building at Balboa Heights made possible the consolidation of all departments and divisions of "The Panama Canal" and the Panama Railroad Company under one roof. As a result practically all of the clerical work, which had perviously been scattered among various parts of the organization, was assigned to the Executive Office, while files, personnel and other records, timekeeping, and property accounting were centralized.

It was now found possible to put into effect the plan of June 30, 1914,[39] with regard to the Executive Department. It follows:

1. The Executive Department embraces the general office business of the Governor, the work under the supervision of the Executive Secretary as given in the executive order of January 27, 1914, the Courts, and the offices of the Special Attorney, the District Attorney, and the Canal Record.

[39] Governor's Circular 660, p. 10.

2. The following is the skeleton organization of the Executive Department:

(a) Executive Office.
  (1) Clerical Bureau.
  (2) Personnel Bureau.
  (3) Time-keeping Bureau.
  (4) Cost-keeping Bureau.
  (5) General Bureau.
  (6) Bureau of Clubs and Playgrounds.
(b) Division of Civil Affairs.
(c) Police and Fire Division.
(d) Division of Schools.
(e) Division of Posts.
(f) Courts:
  (a) Supreme Court.
  (b) District Court.
  (c) Magistrates' Courts.
(g) Special Attorney's Office.
(h) District Attorney's Office.
(i) The Canal Record Office.

3. The Executive Office will be in charge of the Executive Secretary assisted by the Chief Clerk. He will be charged with keeping the time of employees; maintaining files, records, and libraries of The Panama Canal; all matters relating to the personnel of employees; the supervision of clubs and playgrounds; and the general office business of the Governor, under the latter's direction.

4. The Division of Civil Affairs is under the direction of a Chief of Division who is charged with customs inspection for the Canal Zone, and the issuance of all licenses except those issued for the Board of Local Inspectors by the Superintendent of Transportation. The Chief of Division is also Administrator of Estates of deceased and insane employees and Shipping Commissioner for the Canal Zone.

5. The Police and Fire Division is under the direction of a Chief, who is charged with the maintenance of the peace and order required by the laws of the Canal Zone, the protection of life and property, and the proper care and custody of prisoners and convicts. He is Coroner of the Canal Zone and Warden of the Penitentiary. He is charged with the duty of protecting from fire both Government and private property.

6. The Division of Schools is under the direction of a Superintendent of Schools, who, under the supervision of the Executive Secretary, shall select and assign the force of teachers, govern the schools, prescribe the courses of instruction, and administer the affairs of the Division.

7. The Division of Posts is under the direction of a Director of Posts, who shall administer the affairs of the Canal Zone postal system, and transact business between that system and other postal systems.

8. The Courts of the Canal Zone, consisting of a Supreme Court, which will cease to exist after the completion of the business now pending, a District Court and two Magistrates' Courts, are charged with the adjudication of civil and criminal cases as provided by the laws prescribing the duties and limitations of the Courts. The expenditures for the Courts, except as fixed by law, shall be made by the Executive Secretary, and the Courts shall furnish to him such reports, statistics or other data as may be re-

quired. The organizations of the Courts are extra-departmental and are embodied herein only to indicate the method adopted for taking care of the material business needs of the Courts.

9. The Special Attorney's Office is under the supervision and direction of the Special Attorney, reporting to the Governor. He is charged with the purchase, under the Governor's direction, of the land within the Canal Zone necessary for the construction, maintenance, operation, sanitation, or protection of The Panama Canal, and shall represent the Government before the Joint Land Commission or other Courts of tribunal in the settlement of land or property claims or claims against the Government for damage to or destruction of private property. He is also charged with the duty of codifying the various laws, executive orders, and ordinances in effect for the Canal Zone.

10. The District Attorney's Office is under the supervision and direction of the District Attorney, who shall conduct all business, civil and criminal, for the Government, except that assigned to the Special Attorney, and shall advise the Governor on legal questions touching the operation of the Canal and the administration of civil affairs.

11. The Canal Record Office is under the direction of a Special Secretary, who shall edit and publish The Canal Record and perform such other duties as may be assigned to him by the Governor.

The integration and reduction process went on steadily. In July 1914, the electrical work connected with municipal water works at Panama and the telephone, telegraph, and signal systems of the Panama Railroad were placed under supervision of the Electrical Division of "The Panama Canal." At the same time the Division of Erection was discontinued and most of its duties were transferred to the control of the Engineer of Maintenance. In October the auditing, collecting, and disbursing functions of the Panama Railroad Company were combined with those of "The Canal," while at the same time a Building Division was organized and placed in charge of the construction of all buildings for "The Panama Canal" the Panama Railroad Company and the Army. The personnel for operation and maintenance of the canal was recruited so far as possible from the construction forces and placed principally in the work of maintenance and operation of locks. By April 1915, the municipal fire-alarm and police signal systems were placed under supervision of the Electrical Division of "The Panama Canal."

The organization plan in general, however, together with the supervising personnel, remained practically unchanged until January 10, 1917, when General Goethals was succeeded as Governor by Col. Chester Harding. By this time the canal had reached the

stage of a completed and smoothly operating enterprise, but meanwhile there had been numerous problems to face.

Construction. Although the canal was open to traffic and had been passing ships through the locks regularly and without trouble since the middle of 1914, numerous primary and auxiliary matters of construction awaited completion.

The operating machinery of the locks had been completed except for the fender chains and fender chain machines. The last detail of each was completed and installed by June 25, 1915, however, thus rounding out the protection device program. The final installation was preceded by a change in the sump pumps to increase sump capacity and lessen the necessity for the use of the pumps. During 1915 also the lock telephone system was completed and the grading and sloping of back fills at the locks was carried on. Temporary wooden buildings housing the repair shops for the locks were replaced with concrete structures and the floating caisson for sealing the lock entrances was delivered and used in connection with painting the gates of the Pacific locks.

Certain electrical construction also remained to be completed after the opening of the canal. The hydro-electric station at Gatun was put in service during July 1914, which entailed the shutting down of the steam plants at Gatun, Empire, and Balboa. By December 1914, all substations were in operation. A new substation was installed at Gamboa to supply current to the municipal pumping plant, to the sand and gravel handling plant of the Panama Railroad, and for local lighting. This was completed in February 1915, and another substation was opened in March to supply the Darien High Power Naval Radio Station.

Numerous other construction projects were also completed by the Electrical Division during 1915. These included underground conduit installations for electric light and power, telephone, telegraph, and fire-alarm in the permanent towns as well as for coaling plants, dry docks, pumping stations, and Army posts. Street lights were also installed in Ancon, Balboa, Pedro Miguel, Gatun, and Cristobal, the program being carried to completion during 1915 and 1916. Light and power installations were completed in the Balboa Shops and the Mount Hope dry docks were electrified. Other work included the installation of a large motor-driven air compressor, rotary converters at Gamboa and at Balboa dock,

pump equipment for dredges, and electrical equipment for naval radio stations and for quarters and other buildings of "The Panama Canal" and the Army and Navy. These projects rounded out the electrical construction program and later activity consisted generally of maintenance and additions and betterments.

Numerous miscellaneous municipal construction projects were completed during the period under consideration. The heavy rise of chlorine content in Miraflores Lake had necessitated the abandonment of this body of water as a source of potable supply, although the pumping station there located had been practically completed. This structure was remodeled for the use of the Fortification Division as a storehouse, and a new pumping station was constructed at Balboa. A pipe line was extended from Miraflores to Gamboa, and the new purification plant at the former location was completed in March 1915, necessitating the construction of a second pipe line from Miraflores to Balboa. An extension was made to the Ancon high-service reservoir, new pump stations were completed at Gamboa, Miraflores, and Balboa, and a large concrete reservoir was constructed at Gatun to replace the steel tank previously in use.

In the field of general municipal construction much was accomplished at Balboa townsite in the building of roads and sidewalks and sewer and water systems, and in grading and sodding, similar work being done at the silver town of La Boca. A sewer outfall from Ancon was also diverted from the Panama system and turned into the Curundu River.

Miscellaneous construction was carried out for the Balboa and Mount Hope oil-handling plants, in connection with the removal of the quarantine station from Culebra Island to Balboa dumps and at the Corozal poor farm and insane wards.

A large amount of construction work was also performed for the Army at Toro Point, Fort Amador, Balboa Heights, and Corozal.

Light-house construction at Punta Mala, Bona Island, and Taboguilla Island, on the Pacific side was completed by the fall of 1915 and the lights put in commission.

Dry dock construction was initiated in 1914 and continued through the year 1915, the work including excavation, concrete work, and considerable placing of iron work. Granite work and

mitre gates were completed and in place by December of that year and the auxiliary machinery for flooding, unwatering, and gate operation was completed so that the main dry dock was ready for use by May 1916.

Work continued on entrance piers and loader and unloader wharves, which were completed in 1916. The sundry civil act of July 1, 1916 (39 Stat. L., 262, 333), provided for the construction of an additional pier at Cristobal. This work was started in 1917.

The coaling plant at Cristobal was placed in service in September 1916, and that at Balboa was completed in December of the same year, but due to delays in the necessary dredging adjacent to the plant, it was not opened for use until after June 1917.

Two fuel oil handling stations were completed and in commission by February 1915, while work on seven commercial and repair wharves progressed to practical completion. The colliers "Ulysses" and "Achilles" were placed in commission in the spring of 1915, as were two tugs, "Gorgona" and "Tavernilla."

The floating cranes "Ajax" and "Hercules" were offered for test in December 1914. The "Ajax," however, collapsed on the over-load test and was wrecked. As a consequence the "Hercules" was altered and strengthened before tests were made. It was finally accepted at the end of March 1915. The "Ajax" was not repaired and accepted until the following year.

Work on the east breakwater at the Atlantic terminal of the canal was completed in November 1916, after many months of delay due to destructive storms in 1915.

The general building construction under way at the beginning of the fiscal year 1915 included the following structures: the administration building, the hydro-electric station, four substations, commissary warehouse, radio-station buildings, twenty-seven four-family and nine two-family permanent quarters, mechanical shops office building, fire station, two commissary buildings, and a schoolhouse. These structures were all completed and occupied during the first half of the fiscal year, with the exception of one building which was finished in May 1915. Approximately an equal number of buildings of various types were started during the year for "The Canal" and appropriations of $700,000 and later $1,290,000 were made available for the construction of barracks and quarters for the Army at several points in the Zone.

During the fiscal year 1916 sixty buildings of various kinds were under construction. These were completed and sixty-eight new projects started. For the Army forty-three buildings were completed and forty-three new structures commenced. The larger projects included the completion of three of the new Ancon Hospital buildings, ready for occupancy by June 1916, a new crematory, and the Colon Hospital which was completed and occupied in April of the same year; also a new terminal building and an ice plant at Balboa and a laundry at Ancon.

The fiscal year 1917 saw even greater activity in miscellaneous building, the program being succinctly reported as follows:

During the year work was in progress on the construction of 307 buildings for the canal, 3 for the railroad, and 64 for the Army. The principal buildings for the canal were the administration building, dispensary, laboratory, and an additional ward in the new Ancon Hospital group; 3 new concrete restaurants at Cristobal, Balboa, and Ancon; 5 new concrete school buildings at Cristobal, Gatun, Pedro Miguel, Ancon, and Balboa; separate storehouses of concrete for electrical supplies, paint, lumber, and general supplies; the concrete grand stand at the baseball and athletic grounds at Balboa; 4 concrete 4-family quarters at Balboa; 174 family quarters of timber construction at Ancon-Balboa; 44 family quarters of timber construction at Pedro Miguel; and 32 12-family sets of quarters of timber construction for silver employees. For the Panama Railroad there were constructed a concrete freight and baggage building at the Cristobal docks, and an electric-charging station at Balboa. The buildings for the Army included additional barracks and quarters at Fort Grant, Fort Sherman, Fort Randolph; artillery headquarters and barracks and band quarters at Fort De Lesseps; and barracks, quarters, shops, and special buildings for the Ordnance Department at the Ordnance Depot at Corozal.[40]

Of these projects for "The Panama Canal" seventeen, including 218 buildings, were completed in the fiscal year 1917; for the Panama Railroad all were completed, and for the Army, seventeen projects with thirty-three buildings were turned over for occupancy.

Construction progress during the years 1914-17 has been discussed in some detail to emphasize the fact that while the canal was opened as a waterway in 1914, it did not, for some years, con-

[40] Governor, Annual Report, 1917, p. 7.

stitute a completely rounded operating enterprise. The auxiliary construction which occupied the energies of "The Canal" forces for a number of years, while not immediately required, was, nevertheless, essential to the permanent, successful operation of the waterway.

The Slides. A huge and threatening task confronted the personnel of "The Canal" which, while theoretically a matter of maintenance, attained such proportions and importance that it was, in practice, a major construction enterprise. This menacing problem was the control of the slides.[41] The Cucaracha Slide was the oldest and most troublesome of these great earth and rock slips. It had pushed across and completely blocked the canal prism in the summer of 1913, and when water was admitted to the channel the passage from Gatun Lake to the south end of Gaillard Cut was closed. The channel was finally dredged and cut to full width and depth by the time the canal was opened to commerce in August 1914.

The fiscal year 1915 saw no recurrence of trouble at Cucaracha, but at East Culebra breaks occurred in the bank, closing the canal to traffic from October 14 to 20 and October 31 to November 4, 1914, and from March 4 to 10, 1915. From this time the dredges were able to keep pace with the material as it slid into the channel, until August 1915, when simultaneous movements of both banks at East and West Culebra began. By September the channel was completely blocked by a mass of earth and rock 250 feet wide, rising sixty-five feet above water level. The canal was closed to navigation until April 1916. During the fiscal year 1916, including the period of this slide, it was necessary to remove more than 12,000,000 cubic yards of material from Gaillard Cut.

No further trouble was experienced until August, when another movement at Cucaracha suspended traffic for eight days. The slides then remained under control until January 1917, when a movement at East Culebra caused a two-day suspension of traffic. Although interruption to navigation was only occasional, it did not mean that slides were quiescent meanwhile. On the contrary, in many cases, there was continual movement or subsidence, but of such moderate speed that excavation could keep pace with it.

[41] For a complete discussion of the problem and methods of prevention see Governor, Annual Report, 1916, p. 27.

Gradually the dredges made headway against the encroaching material and as the canal reached normal width and depth, excavation was continued until at points of slide activity the width of the channel was increased from 200 to 500 feet beyond navigation needs. Thus bays were created which not only served to protect the main channel from encroaching material but also permitted dredges to work against active slides before they reached the channel and without interfering with navigation.

Maintenance. With the exception of the removal of the slides which, because of their volume, assumed the proportions of a major construction enterprise, the maintenance work on the canal gradually approached a routine status. A number of puzzling problems still remained, however, among which were the corrosion, rusting, and similar break-down of materials.

Galvanic or voltaic action between metals of different kinds was found to have taken place in the salt water, particularly at the locks. Various experiments were conducted to find a solution of the trouble. In numerous cases metals of different kinds in juxtaposition were replaced by those of like kinds in order to prevent electrical action. In other cases green-heart timber and lignum-vitæ were substituted for metal. Later inspection proved the experiments to be only partially successful. In the autumn of 1915 the counter-weight on one of the spill-way gates at Gatun gave way while the gate was idle. Examination showed that the failure was due to the shearing of certain manganese steel bolts on the gate. To forestall further failures steel bolts were substituted. At other points various kinds of paint were tried for metal protection. Bitumastic enamel seemed to give best results both for protection and insulation from galvanic action, and it was used wherever feasible. In one case crude oil was forced through a small pipe to protect rollers under water. Other protective measures adopted were but partially successful.[42] Later a patented machine-applied coating of zinc for underwater metal surfaces was tried with seeming promise of success.

Other failures also occurred. In September 1915 a vessel approaching the locks failed to slow down and rammed the protecting fender chain. The chain snapped without appreciably check-

[42] A detailed discussion of the protective measures used can be found in Annual Report of the Governor, 1916, pp. 14-16.

ing the headway of the vessel. The ease with which this barrier was broken gave rise to serious doubts as to the efficacy of the system. A committee was therefore appointed to make test of the chains and chain-operating or checking machines. The findings confirmed the adequacy of the design of the chain fender machines, but the committee made recommendations regarding certain adjustments as well as minor alterations in construction.

The subsidence of sections of the Gatun Dam and Mindi Levee occurred in 1915 and it was necessary to add considerable fill at the points where settling was evident.

The maintenance matters just discussed were concerned almost wholly with the primary features of canal operation, that is, locks, dams, etc., but the maintenance of equipment necessary for canal operation was also an extensive and important activity.

The Mechanical Division was responsible for this class of equipment, and as stated in an annual report:

> The general character of the work is in a state of transition from the construction conditions, under which the majority of the work was on railroad and excavating equipment, to the conditions of operation, under which the amount of railroad work will be relatively small, and repairs on floating equipment of all kinds, together with such as may come to the shops by vessels using the canal, will constitute the majority of the work.[43]

The slides demanded the retention in service of maximum dredging equipment, which, in turn, necessitated the continuance of certain shops and other maintenance equipment which might otherwise have been retired. During the fiscal years 1915 and 1916 most of the maintenance work in the shops was on dredging equipment. Later, as the slides subsided, attention was turned to the maintenance and repair [44] of railroad equipment, and by 1917 mechanical maintenance was largely concerned with marine equipment which continued to furnish the principal maintenance work of the shops.

In the early years of canal operation the repair work at docks and shops was done almost solely on "Canal" equipment. In 1915,

[43] *Ibid.*, 1915, p. 30.

[44] Largely to recondition rolling stock which was being transferred to the Alaskan Engineering Commission (fifteen locomotives, one hundred flat cars, two unloaders, forty dump cars, and two steam shovels) and sold to private contractors (ninety-five locomotives).

however, service was given to the Navy and a Panaman steamship was also included. By 1916 this work had expanded, the Cristobal dry dock, for instance, caring for five Army vessels, eight Navy vessels, two Panama Government vessels, and four commercial vessels, in addition to eighty-nine vessels engaged in "Canal" work, while

three manufacturing orders of considerable magnitude were accomplished for the *Ferrocarril de Arica a La Paz,* consisting of six cast-steel frames for geared mountain climbing locomotives, 3000 semi-steel rail chairs, and 16 steel gears for use on locomotives.[45]

The year 1917 saw still further expansion of this type of work, including, in addition to "Canal" work, repairs to three commercial ships, and the overhauling of four seized German ships. At the dry docks there were handled, in addition to "Canal" equipment, thirty-one vessels for the War and Navy departments and thirty-three for commercial companies.

On account of the facilities afforded by the Balboa shops and dry docks and the congested condition of the shipyards in the States, upon the recommendation of the superintendent of the division the suggestion was made to Government departments interested that the mechanical division of the canal might be considered available for a limited amount of construction and repair work that would, under usual circumstances, be performed in the States. As a result the construction of a 120-foot coast-guard cutter for the Navy Department is under way, and the extensive overhaul of the steamers *Ancon* and *Cristobal,* operated by the Panama Railroad, will be undertaken at the Balboa dock and shops.[46]

Thus there occurred a gradual growth in the repair and construction work on commercial vessels, which was to become an important part of the business operations of "The Canal."

Supplies and Subsistence. Closely related to this work in principle, though not, of course, in type, were the activities concerned with material, supplies, and subsistence. The original purpose of this work, like that of the shops, was to care for "Canal" needs, but it was gradually expanded to include other governmental and commercial services.

[45] *Ibid.,* 1916, p. 45.
[46] *Ibid.,* 1917, p. 24.

During the construction of the canal, and at the time of the opening, tourist traffic was heavy and the hotels and messes in the Zone did considerable business. The outbreak of the war in 1914 caused a marked drop in such traffic, as did the slides and the six-month closure of the canal to traffic. In 1916 a revival in tourist traffic was noted and a marked increase in the use of hotels and restaurants on the Isthmus came about through the growing interest of American business men in Panama and South America. The traffic increased early in 1917, largely due to the fact that steamship lines operating down the west coast of South America made Colon their terminal point, but with the entrance of the United States into the war, there was a practical cessation of tourist traffic.

During 1915 the sale of supplies to the Army and Navy and to commercial ships was negligible but by 1916 the business had begun to assume importance. In the latter year

> Material to the value of $220,116.40 was sold from the storehouses to the United States Army organization stationed on the Isthmus. The principal items consisted of forage, lumber, building material, and general hardware. There was an increase in value of supplies sold to steamships in transit through the canal and those touching at the two terminals. The value of supplies sold was $70,918.22, representing miscellaneous ship supplies for 860 steamers.[47]

Fuel oil and gasoline sales also rose. Over 60,000 barrels of the former were sold and 893,165 barrels were handled for outside interests, while almost 200,000 gallons of gasoline were sold to commercial concerns in the fiscal year 1916.

By 1917 the sale of general supplies to other government departments and to non-government interests had reached a total of approximately $60,000, and

> the total fuel oil handled by the plants at Balboa and Mount Hope tank farms amounted to 2,975,223 barrels for 406 vessels, an increase of 719,104 barrels and of 96 vessels receiving oil, as compared with the previous year.[48]

During 1915 quarters for employees proved to be a problem. While the termination of construction had released many employees, the unexpected increase in the number of men needed

[47] *Ibid.*, 1916, p. 47.
[48] *Ibid.*, 1917, p. 27. Gasoline for this year was included in general sales.

on terminal construction and fuel handling and the abandonment of certain settlements to the Army had decreased both the expected loss of employees and the accommodations available. During the next two years, however, the increased building program accompanied by a reduction of forces somewhat stabilized the housing situation.

Labor. The enrollment of labor forces on the Isthmus at the close of the fiscal years 1915, 1916, and 1917, was as follows:

Fiscal year	Number of employees		
	Gold	Silver	Total
1915	3593	23,304	26,897
1916	3492	19,970	23,462
1917	3549	20,597	24,146

The changes in the work are reflected in this table. The sharp drop in the number of employees in 1916 occurred chiefly among those engaged in dock and terminal construction and signified the approach of this program to completion, while the reduction in the dredging forces came with the conquest of the great 1915 slide. The marine forces increased with the traffic, while fortification, building, and general construction reflected the variations in appropriations available. A cattle raising experiment brought a large group of silver employees to this phase of activity while, to compensate, the commissary, subsistence and quartermaster groups dropped off. The elimination of contractors' employees was an interesting feature of this period and one significant as to the progress of canal construction.

The Washington office also showed interesting changes in personnel figures. During 1914, 2248 persons above the grade of laborer were tendered employment, while during 1915 the number dropped to 899. Of these 652 were appointed. In 1916, 1176 persons were offered positions and but 616 accepted. The difficulty lay chiefly with skilled mechanics, who were being attracted to ship-yards, and to munition and other war manufactures by high wages. The trend continued in 1917, when 1417 tenders were made and but 767 were accepted. Here again the war was making itself definitely felt in "Canal" affairs.

Sanitation. By 1915, the work of sanitation on the Isthmus had become largely a routine matter accompanied by certain constructive prevention work. The epidemics were long since past.

The Health Department was charged with the care of sick and injured, street cleaning and garbage removal in Panama and Colon, and all quarantine matters. These duties in general were comparable to those of any municipal health department and included the operation and maintenance of hospitals and allied institutions.

Disease prevention, which included quarantine work, is of interest because of Isthmian health history. Yellow fever, malaria, bubonic plague, and smallpox had all menaced the Isthmus at some time. The control of these diseases during the early operating period of the canal was (and still is) important, not only as a health measure, but also as a means of eliminating fear among the canal workers.[49]

In 1915 there were two cases of smallpox on the Isthmus, both brought in by steamers. One case had practically recovered upon arrival. No quarantinable diseases of any other nature originated or were brought into the Isthmus during this year. During the next year no smallpox nor plague cases occurred, but four cases of yellow fever were brought into quarantine by ships from Colombia. No secondary cases developed and none originated on the Isthmus. In 1917 no yellow fever or plague appeared. One case of smallpox was brought from Panama City and from this two secondary cases arose.

These figures show eloquently the progress of control over disease on the Isthmus with the exception of malaria, the story of which is not so encouraging. Elimination of the local-breeding *Aedes aegypti* mosquito had terminated yellow fever, vaccination and quarantine had extirpated smallpox, and rat elimination had conquered the plague, but the *Anopheles* mosquito, breeding in the open country, was still a problem. The rapid growth of the city of Panama (some 33 per cent in two years) had spread the borders out into malarial districts, which required a great amount of drainage and jungle clearing. In addition certain fills had settled unevenly, resulting, after rains, in breeding pools for mosquitoes, and even the hoof-prints of cattle filled with water and were found to harbor the larvæ. In spite of these difficulties, however, the hospital admission rate for malaria (the principal

[49] The yellow-fever panic during construction days in 1905 is not to be forgotten.

cause, by a great margin, of disability on the Isthmus) in 1915 was reduced 20 per cent as compared with the previous year, in 1916, 48 per cent as compared with the previous year, and in 1917, approximately 60 per cent.[50]

The Panama Railroad. The fiscal year 1915 saw a complete change in the status of the Panama Railroad. The opening of the canal in 1914 terminated all through freight for the railroad and placed it in the position of a local carrier only. Financial readjustments became necessary.

Due to the fact that all of the Rail Road's property and facilities had been continuously applied to facilitating canal construction and operation, and that incidentally there had been arranged between the two interests a system of "plant exchange" without added capital responsibility that produced rapid variations in the character and conditions of the Company's plant and appurtenances to the extent of abandoning its original line of road and double-tracked roadway and of relocating and reconstructing the Railroad, which work was done by the Panama Canal and at its own expense, it became necessary that an actual physical inventory of the larger part of this Company's property on the Isthmus to be established prior to the expiration of the fiscal year. Such an inventory was completed and, thereby a relatively definite starting point for the readjustment of Property Accounts and Reserves for Accrued Depreciation was established.[51]

Changes in organization were also made.

The Washington Hotel, the Commissary Department, Telegraph and Telephone Plant, and Gamboa Gravel Plant are maintained and operated for this Company's account by the Panama Canal. Material and supplies for the Railroad are brought by the General Purchasing Officer of the canal, and under like arrangements the docks and tracks of the Panama Canal are, and the permanent coal plant when completed will be, operated by the Panama Railroad Company.[52]

These new arrangements had scarcely been put under way, however, when the canal was closed by the slides of 1915. Under these circumstances the railroad had to resume immediately the transshipment across the Isthmus of goods which had been lying

[50] The institutional admission rates per 1000 employees for malaria were: 66.6 in 1915, 34 in 1916, and 13.47 in 1917.

[51] Panama R. R., Annual Report, 1915, p. 5.

[52] *Ibid.*, p. 33.

Panama Railroad Operating Statistics

Item	1915	1916	1917	1918	1919
Average miles operated	56.54	56.54	56.54	56.54	55.30
Gross revenue	$2,120,729.11	$2,954,693.78	$1,707,392.04	$1,739,541.23	$2,165,589.58
Operating expenses	2,127,314.46	2,111,668.78	1,688,661.38	1,440,421.26	1,979,710.16
Net revenue	[a]6,585.35	843,025.00	18,730.66	299,119.97	185,879.42
Per cent expenses to revenue	100.31	71.47	98.90	82.80	91.42
Gross revenue per mile of road	.....	52,258.47	30,197.95	30,766.56	39,160.75
Operating expense per mile of road	.....	37,348.23	29,866.67	25,476.15	35,799.46
Net revenue per mile of road	.....	14,910.24	331.28	5,290.41	3,361.29
Revenue per passenger train mile	.....	3.82	2.38	2.50	4.04
Revenue per freight train mile	.....	12.06	6.21	7.76	7.17
Total revenue train mileage	340,635.00	378,031.00	434,124.00	389,276.00	311,579.00
R. R. revenue per train mile	.....	.....	3.93	4.47	6.95
R. R. operating expense per revenue train mile	.....	.....	3.89	3.70	6.35
Net R. R. revenue per revenue train mile	.....	.....	.04	.77	.60
Gross revenue per revenue train mile	6.23	7.82	.....	.....	.....
Operating expenses per revenue train mile	6.25	5.59	.....	.....	.....
Net revenue per revenue train mile	[a].02	2.23	.....	.....	.....

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aboard the blockaded ships. All freight brought to the railroad company's terminals on each ocean was transshipped by rail between steamers. The plan adopted gave sea carriers the option of a special flat rate of $3 per ton for cargo hauled directly between ships, with the railroad relieved of responsibility for loss or damage, or of regular classified rates established to meet the situation.

General statistics, which for reasons of convenience include the fiscal years 1918 and 1919, follow:

PANAMA RAILROAD FREIGHT TONNAGE

Description	1915	1916	1917	1918	1919
Through commercial	215,856	453,970	60,369	40,820	27,847
Local commercial	154,040	323,961	117,282	71,834	65,785
Commercial — Balboa and Panama	23,862	15,290	.....	.....	.....
Local Panama Canal.....	615,985	561,041	466,431	251,062	240,122
Local Commissary	.....	.....	54,222	63,810	52,988
Local Army and Navy....	.....	.....	24,415	38,069	58,437
Company	80,205	41,743	40,766	26,412	17,947
Total	1,089,948	1,396,005	763,485	492,007	463,136

The effects of the six months closure of the canal show clearly, followed by the steady reduction in traffic as the canal resumed its place as the trans-Isthmian carrier.

The number of passengers carried during these years was as follows:

1915.....	1,826,078	1917.....	1,574,404
1916.....	1,564,897	1918.....	1,754,950
1919.....	1,893,275		

General operating statistics for the five years mentioned are given in the table on page 39.

The Panama Railroad Steamship Line. The steamship line, meanwhile, had been operating under the unusual conditions brought about by the war, including the change in type and destination of cargoes and rapidly increasing costs. In 1917 with the declaration of war by the United States all Panama Railroad seagoing vessels were armed and four interned German vessels were taken over and placed in service.

The traffic figures, on the opposite page, again include the war years.

Freight Tonnage Transported

	1915		1916		1917		1918		1919	
	Ships	Tonnage	Ships	Tonnage	Ships	Tonnage	Ships	Tonnage	Ships	Tonnage
Panama R. R. ships:										
Arrived	27	51,454	51	126,935	48	115,603	53	139,109	47	125,491
Sailed	28	62,161	51	153,577	46	137,637	53	139,839	46	129,800
Chartered passenger ships:										
Arrived	41	126,947	17	135,364	[a]27	[a]162,626	45	269,292	111	780,943
Sailed	41	218,808	16	161,810	20	130,794	26	81,815	17	67,353
Total	137	459,370	135	577,686	141	546,660	177	630,055	221	1,103,587
Total freight revenue		$81,910,562.94		$2,668,067.64		$3,525,206.06		$4,971,684.36		$18,438,638.43
Average rate per ton		4.16		4.62		6.45		7.89		7.65

[a] Includes four chartered freight ships carrying 3390 tons.

These figures very clearly reflect the unusual conditions arising from the war resulting in increased trade for the ships of the Panama Railroad which did not increase their charges at the rapid rate that other lines adopted.

The passenger traffic statistics are given in the table on the opposite page.

Zone Government. The government of the Canal Zone differed in no essential from that of any United States municipality so far as administration went, though the principle was highly paternalistic. There were, however, certain additional activities which normally are carried on by the national government. These included customs, certain shipping matters, the postal service, and relations with Panama.

The Customs Bureau of "The Panama Canal" performed duties comparable in every respect to those of the United States Customs Service, simply substituting on the Isthmus, "Panama Canal" employees for those of the Treasury Department. In addition however, the Bureau administered certain of the Chinese exclusion laws,[53] which in the United States would have been under jurisdiction of the Bureau of Immigration. An addition to these duties by including aliens other than Chinese was made possible by the act of August 21, 1916 (39 Stat. L., 527), which in Section 10 authorized the President "to make rules and regulations . . . touching the right of any person to enter or remain upon or pass over any part of the Canal Zone," and provided punishments for violations of such rules and regulations.

Under the authority of this law, the President, on February 6, 1917, issued an executive order (No. 2526) repealing the order of 1908, which had extended the Chinese exclusion laws of Panama to the Canal Zone, and establishing rules which excluded from the Zone all Chinese except diplomatic agents, those in transit through the Zone, and those receiving special permission from the Governor.

Certain employees of the Customs Bureau also acted as deputy shipping commissioners.[54]

[53] Some of these, up to 1917, were exclusion laws of the Republic of Panama, applied to the Canal Zone by the executive order of January 9, 1908.

[54] The head of the Division of Civil Affairs was made Shipping Commissioner, his authority being confirmed by the act of August 21, 1916.

Passengers Carried

	1915		1916		1917		1918		1919	
	Ships	Passengers	Ships	Passengers	Ships	Passengers	Ships	Passengers	Ships	Passengers
Panama R. R. ships:										
Arrived	27	2,105	51	4,931	48	3,847	53	5,091	47	5,985
Sailed	28	2,420	51	4,852	46	3,842	53	3,948	46	4.919
Chartered passenger ships:										
Arrived	41	5,049	17	902	23	770	35	132	19	611
Sailed	41	4,991	16	659	20	660	25	19	18	132
Total	137	14,565	135	11,344	137	9,119	166	9,190	130	11,647
Total passenger revenue		$464,066.21		$362,312.51		$288,487.65		$309,302.51		$433,133.42
Average rate per passenger		31.86		31.94		31.64		33.66		37.19

The administration of estates, a duty coming under the jurisdiction of the Division of Civil Affairs, partook of the nature of a county or state activity rather than municipal.

The duties included under the title of " relations with Panama " were numerous and varied, involving the issues which must continually arise where so intimate an interrelation of national interests occurs as on the Isthmus. The activities were largely those which under ordinary circumstances would fall within the province of the State Department.

The Law Department, during the years 1915-17, was continuously engaged in codifying the laws of the Canal Zone and defending the interests of the United States before the Joint Land Commission.

The supervision of play and recreation was continued and expanded along the lines which had been adopted during the construction period.

The police and fire departments of the Zone were organized and equipped according to general municipal practice. During 1915 the police were engaged, in addition to their regular duties, in assisting in the depopulation of the Canal Zone,[55] and in assisting customs officers in the suppression of the opium traffic. Additions to the police force were made in 1917 for the purpose of protecting canal structures when participation in the war was imminent. Upon the declaration of war this work was transferred to the military establishment.

Schools had been organized following the methods and curricula prevalent in the United States, separate buildings being maintained for white and colored children. The enrollment of white children increased from about 1200 in 1914 to 1518 in 1917, while the number of colored pupils decreased from 1492 in 1914 to 855 in 1917. Industrial training courses with after-hour employment were established in 1915, and a high school with full four-year course was maintained at Balboa. A four-year high-school commercial course was established in 1916, and in 1917 domestic science was added to the industrial training branch.

Canal Traffic. The development of canal traffic during the fiscal years 1915, 1916, and 1917 is, perhaps, best shown in tabular form.

[55] Rural only. In this process 1136 houses were evacuated and destroyed.

SUMMARY OF CANAL TRAFFIC, FISCAL YEARS 1915 TO 1917 INCLUSIVE

	Ships	Net tons	Cargo tons
1915			
Atlantic to Pacific	530	1,844,728	2,125,735
Pacific to Atlantic	558	1,958,307	2,844,057
Total	1,088	3,843,035	4,969,792
1916			
Atlantic to Pacific	411	1,308,231	1,434,236
Pacific to Atlantic	376	1,171,531	1,705,810
Total	787	2,479,762	3,140,046
1917			
Atlantic to Pacific	905	2,925,414	3,076,843
Pacific to Atlantic	971	3,083,944	4,152,412
Total	1,876	6,009,358	7,229,255
Grand total	3,751	12,332,155	15,339,093

The effect of the closing of the canal to traffic because of the slides in 1916 is clearly observable in the table, as is the preponderance of east-bound cargoes supplying Europe with food and materials.

The number of vessels of American registry included in the table was 470 in 1915, 238 in 1916, and 464 in 1917.

For every ship passing through the canal in 1917, thirteen men bent to their daily tasks and for every dozen men at work a child was enrolled at school [56] with all the intricate details of feeding, clothing, education, recreation, housing, transportation and the protection of person, property and health which these statements connote. The passage of one ship through the locks brought to a focus all of the complicated machinery and methods required for the operation of modern transportation and the accompanying necessities concerned with the conduct of human affairs in a civilized state.

Legislation. During the fiscal year 1915, nineteen acts were approved which, generally or specifically, affected the conduct of "Panama Canal" affairs, in addition to one convention which was

[56] An approximate ratio. The figures are 1876 ships compared to 24,146 employees and 2373 pupils as of June 30, 1917.

proclaimed. In the same period thirty-three executive orders which likewise affected "The Panama Canal" were issued, including four by the Secretary of War.

Of the nineteen statutes, four were private acts for the relief of individuals, and four applied to the Canal Zone only incidentally or with no more specific intent than to other territorial divisions of the United States.[57]

The act of August 1, 1914 (38 Stat. L., 609, 667), provided, in addition to general appropriations for "Canal" work, funds for government participation in the prospective Panama-Pacific Exposition, while the act of August 18, 1914 (38 Stat. L., 698), repealed certain instructions regarding "the admission of foreign-built ships to American registry for the foreign trade" contained in the Panama Canal Act. On August 25, 1914, an act presenting the steam launch "Louise" to the French Government was approved, (38 Stat. L., 709). The first act of March 4, 1915 (38 Stat. L., 1116, 1127), appropriated funds for United States participation in an exposition to be held by the Government of Panama in the city of Panama. A second act of March 4, 1915 (38 Stat. L., 1190), provided "for recognizing the services of certain officers of the Army, Navy and Public Health Service for their services in connection with the construction of the Panama Canal, to extend to certain of such officers the thanks of Congress, and for other purposes."

The remaining six acts of the fiscal year 1915 dealt with various appropriation matters.[58]

The convention between the United States and the Republic of Panama defined the boundary lines of the Canal Zone. It was signed on September 2, 1914, and proclaimed February 18, 1915.

The thirty-three executive orders issued during the fiscal year 1915 varied widely in subject matter and importance. The tabulation on the opposite page indicates their scope and content.

A glance at the subject matter of these orders will show that, with few exceptions, they are concerned with matters which in

[57] These were 38 Stat. L., 454, 508, concerning use of appropriations; 38 Stat. L., 773, 774, extending Interstate Commerce Commission appropriations; 38 Stat. L., 785, with regard to the opium trade; and 38 Stat. L., 997, 1049, dealing with expenditures for periodicals.

[58] One (38 Stat. L., 927) provided funds for two new lighthouses at the Pacific end of the canal.

Date	Number	Issued by	Subject matter
July 3, 1914	1975	President	Duties of Clerk of District Court and assistant
July 9, 1914	1988	President	Ocean going vessels to be fitted with wireless apparatus
July 9, 1914	1989	President	Board of Admeasurement to administer oaths, etc.
July 9, 1914	1990	President	Regulations for operation and navigation of Panama Canal
July 30, 1914	....	President	Setting aside area for radio station
Aug. 3, 1914	2007	President	Duties of constables
Aug. 6, 1914	2014	President	Reorganized Board of Health
Aug. 8, 1914	2016	President	Customs service regulations
Aug. 14, 1914	2018	President	Postal crimes
Aug. 14, 1914	2019	President	Security for costs in civil cases
Aug. 14, 1914	2020	President	Amending previous order re quarantine regulations
Aug. 22, 1914	2026	President	Operation of street railways at crossings
Sept. 3, 1914	2037	President	Amending Ex. O. No. 1990 above
Sept. 5, 1914	2040	President	Repealing executive order establishing postal savings system
Sept. 8, 1914	....	Sec. War	Fixing compensation of individual
Sept. 19, 1914	2051	President	Amending law against gambling
Sept. 19, 1914	2052	President	Amending executive order re compensation for injured employees
Sept. 29, 1914	....	Sec. War	Amending regulations for payment of tolls
Oct. 13, 1914	2062	President	Providing for license fees and taxes
Nov. 4, 1914	2073	President	Amending Ex. O. No. 1990 above
Nov. 13, 1914	1287	President	Proclamation: Neutrality of Canal Zone
Nov. 16, 1914	....	Sec. War	Authorizing passage of vessels without measurement under certain conditions
Jan. 11, 1915	2118	President	Amending quarantine regulations
Jan. 15, 1915	2120	President	Conditions of employment
Jan. 19, 1915	2121	President	Amending civil service rules
Feb. 4, 1915	2135	President	Establishing regulations in accounting
Mar. 1, 1915	2142	President	Concerning the opium traffic
Mar. 23, 1915	2152	President	Reinstatement of individual
Apr. 7, 1915	2164	President	Concerning issuance of certificates of registry for vessels
Apr. 27, 1915	2185	President	Changing name of Culebra Cut to Gaillard Cut
May 12, 1915	....	Sec. War	Regulations for sale of material
May 25, 1915	2204	President	Modifying charges against employees for rent, etc.
June 8, 1915	2208	President	Designating official flag for Governor of "Canal"

the United States would be under the jurisdiction of various government departments, or, in some cases, under a state, county, or municipality. Few apply directly to the navigation and operation of the canal.

Legislation during the fiscal year 1916 was greatly curtailed as compared with that of the previous year, but three acts being passed which applied to "The Panama Canal" either specifically or generally. Of these two were appropriation acts and one the National Defense Act of 1916,[59] the provisions of none being of any vital moment in immediate "Canal" affairs.

Executive orders were also fewer in number, but five being issued. Two of these were concerned with the appointment of individuals, one provided recess and leave regulations for the Joint Land Commission, one referred to assistance to the Governor by military and naval forces, and the last related to appointments under the classified civil service.[60]

The fiscal year 1917 saw a great increase in legislation which affected "The Panama Canal," twenty-seven acts having been passed before July 1. But one of them, excepting appropriation and private relief acts, might be said to apply solely to the "Canal," however.

Of these laws, two were private acts, while sixteen were concerned with appropriations affecting "Canal" affairs.[61] Of the remaining nine acts, eight concerned matters which affected "The Canal" but applied to other divisions of the United States Government as well. These eight laws dealt with employees' compensation for injuries,[62] establishment of the United States Shipping Board,[63]

[59] Respectively 39 Stat. L., 14; 39 Stat. L., 66; and 39 Stat. L., 166.

[60] These orders were respectively: Sec. War, Mar. 25, 1916; Sec. War, May 13, 1916; Sec. War, Oct. 16, 1915; Sec. War, Oct. 16, 1915; President (No. 2382), May 17, 1916; and President (No. 2410), June 30, 1916.

[61] Those concerned with appropriations were: 39 Stat. L., 252, 259, 262; 39 Stat. L., 262, 287, 318, 332; 39 Stat. L., 446, 448; 39 Stat. L., 556, 582, 607; 39 Stat. L., 619, 623, 636, 639, 640; 39 Stat. L., 801, 802, 811, 821; 39 Stat. L., 909, 910; 39 Stat. L., 1047, 1055, 1058; 39 Stat. L., 1070, 1106, 1121; 39 Stat. L., 1134, 1136, 1137; 39 Stat. L., 1168, 1192, 1193; 40 Stat. L., 2, 28; 40 Stat. L., 40, 60, 61, 72; 40 Stat. L., 105, 162, 176; 40 Stat. L., 182, 196, 201, 217; 40 Stat. L., 240.

[62] 39 Stat. L., 742-750.

[63] 39 Stat. L., 728.

immigration,[64] transfer of certain retired Army officers to the active list,[65] amendment of the criminal code,[66] seizure of enemy vessels,[67] strengthening the Navy and Marine Corps,[68] and espionage.[69]

The act approved August 21, 1916 (39 Stat. L., 527), "An act extending certain privileges of canal employees to other officials

Date	Number	Issued by	Subject matter
July 25, 1916	2428	President	Free use of quarters, fuel and electric current
Aug. 10, 1916	2440	President	Amending Ex. O. 2428
Sept. 5, 1916	2451	President	Operation of motor vehicles.
Sept. 15, 1916	2455	President	Transferring to Governor of "The Panama Canal" administration of Employees Compensation Act of Sept. 7, 1916, so far as "Panama Canal" and railroad employees went
Oct. 17, 1916	2475	President	Commutation of leave privileges
Oct. 22, 1916	2479	President	Interest on money orders deposited—Canal Zone
Jan. 15, 1917	2514	President	Conditions of employment
Feb. 6, 1917	2526	President	Exclusion of Chinese
Feb. 6, 1917	2527	President	Exclusion of undesirables
Mar. 20, 1917	....	Sec. War	Compensation of Joint Land Commission Umpire
Apr. 9, 1917	....	President	Control of canal and Canal Zone during hostilities
May 23, 1917	1377	President	Proclamation: Regulation, management and protection of canal and maintenance of neutrality
June 30, 1917	....	President	Acquisition of enemy vessels

of the Canal Zone and authorizing the President to make rules and regulations affecting health, sanitation, quarantine, taxation, public roads, self-propelled vehicles, and police powers on the Canal Zone and for other purposes including provisions as to

[64] 39 Stat. L., 874, 878, 897.
[65] 39 Stat. L., 937.
[66] 40 Stat. L., 39.
[67] 40 Stat. L., 75.
[68] 40 Stat. L., 84, 89.
[69] 40 Stat. L., 217.

certain fees, money orders and interest deposits," supplemented the rules and regulations in force previous to the passage of the Panama Canal Act, which had ratified and confirmed as valid and binding the existing "laws, regulations and ordinances adopted and promulgated in the Canal Zone by order of the President for the Government and sanitation of the Canal Zone and the Construction of the Panama Canal" until such time as Congress might otherwise provide.

Eleven executive orders and one proclamation were issued by the President between June 30, 1916, and July 1, 1917, in addition to one by the Secretary of War. The tabulation appears on page 49.

As was the case with previous executive orders most of those issued in 1917 simply put into effect on "The Panama Canal," matters which in the United States would have been cared for by such government organizations as the Bureau of Immigration, the State Department, and the Civil Service Commission, or a state or municipality.

The War. Although the United States was engaged in the war but eighteen months, the two fiscal years 1918 and 1919 include the period in which "The Canal" was most vitally affected by war conditions. The effects were hardly felt before July 1, 1917, nor were they effaced to any degree before June 30, 1919.

Organization. While the war caused no major change in the type of organization, so far as the functions and relations of the administrative units were concerned, the fundamental control was vitally altered. This was accomplished by the executive order of April 9, 1917, which the President issued under the authority granted to him by the Panama Canal Act of 1912. By it the President ordered that the commanding officer of the troops stationed in the Canal Zone should "have exclusive authority and jurisdiction over the operation of the Panama Canal and all its adjuncts, appendants, and appurtenances, including the entire control and government of the Canal Zone, and, while this order is in force, the Governor of the Panama Canal shall, in all respects and particulars as to the operation of the Panama Canal, and all duties, matters and transactions affecting the Canal Zone, be sub-

ject to the orders and direction of the Officer of the Army hereby designated." [79]

Thus the canal became, in effect, a military reservation.

The major divisions or units of the organization remained the same in 1918 as in previous years but certain changes occurred in the organization supervised by the Engineer of Maintenance. In 1917 the units under his control consisted of: (1) Engineer of Docks, (2) Division of Municipal Engineering, (3) Building Division, (4) Electrical Division, (5) Division of Lock Operation, (6) Office Engineer, (7) Assistant Engineer, terminals, (8) Assistant Engineer, surveys, and (9) Chief Hydrographer. By 1918 these units had been reduced to eight.

The Division of Municipal Engineering, the Electrical Division, the Division of Lock Operation, and the Office Engineer remained as previously. The Building Division was transferred from the supervision of the Engineer of Maintenance and placed under the direct jurisdiction of the Department of Operation and Maintenance, thus displacing the Dredging Division, which reciprocally was transferred to the control of the Engineer of Maintenance. The unit previously designated merely as "Assistant Engineer, Surveys" became the Section of Surveys and that known as "Chief Hydrographer," the Section of Meteorology and Hydrography, while the Office of Engineer of Docks was absorbed by the Building Division. The Office of Assistant Engineer, terminals, was eliminated, and a new unit called "Maintenance of Gatun Dam" was created.

The organization under the Engineer of Maintenance, therefore, by July 1, 1918, consisted of the following units:

1. Division of Municipal Engineering, under a municipal engineer
2. Dredging Division, under a superintendent of dredging
3. Electrical Division, under an electrical engineer

[79] On May 17, 1916, the President had issued an executive order (No. 2382), which provided:

"Under the provisions of the Panama Canal Act the Governor is charged with the protection of the Canal until such time as the President may designate an officer of the Army to have entire control of the Canal and the Canal Zone during the time of war or threatened war. The military and naval forces stationed in the Canal Zone will furnish such assistance to the Governor in the performance of this duty as the respective commanding officers may be requested by him to render.

4. Division of Lock Operation, with two superintendents, one for the Atlantic locks and one for the Pacific
5. Office Engineer
6. Maintenance of Gatun Dam, under a foreman
7. Section of Surveys, under an assistant engineer, and
8. Section of Meteorology and Hydrography, under a chief hydrographer

This organization remained unchanged through the fiscal year 1919.

Difficulties arose in manning the organization, however, as the drain of war service and industries began to make itself felt. This became so serious in 1918, when some employees in the higher grades desired to enlist in the Army or Navy, that the Governor declined to release them on the ground that they could not be spared without seriously crippling essential work of "The Canal." As he said in his annual report:

> They were performing patriotic service for the country in capacities for which they were particularly qualified by training and experience, and there would have been no net gain to our belligerent forces on account of their release from the canal, as their positions must have been filled by others less well qualified for their duties here and equally as well qualified as they for military service.[71]

Early in 1919 the civilian control of "The Canal" was resumed by executive order (No. 3032).

Construction. The terminal construction work on the canal which had been placed under the Building Division, continued during the war years, as, in fact, did the entire construction program. Progress was steady, but the increase of prices was making itself felt, especially with regard to steel work. As a result redesign was resorted to, and wherever possible concrete was substituted for steel. This gave rise to some difficult problems in design which were finally solved, the substitution resulting in a considerable saving of money, but not sufficient to overcome a prospective deficit. This saving, it was estimated, amounted to approximately $200,000 on the roof trusses of Pier No. 6 alone, but it was necessary to add to the original cost limit of $1,500,000, a deficiency item of nearly $600,000.

[71] Governor, Annual Report, 1919, p. 2. In all 394 employees were released during the war to enter the military or naval service.

In spite of labor, matériel, and financial handicaps, much important construction work was completed. Among the major projects was the pier mentioned, together with the adjacent boat landing and launch house, at a total cost of over $2,100,000, and the Ancon Hospital group project,[72] started in 1915, involving a cost of over $1,700,000.

There were completed during the fiscal year 1918 for "The Panama Canal," besides the structures mentioned, one storehouse, twenty-five one-family quarters, twenty-seven four-family quarters, thirty-three twelve-family quarters, a mess building and pattern shop, an office building, an incinerator, and five school buildings.

The construction work for the following year included the completion (in addition to the hospital buildings) of a restaurant, an oil tank, a clubhouse, a boat house and two storage buildings for "The Panama Canal," and an ice plant, a slaughter-house, a meat-canning plant, and a fertilizer plant for the railroad company.

Work continued for the Army and Navy also, though with the signing of the armistice some of it, especially on cantonments, was suspended. The work in process included a naval submarine base, a Navy and an Army aviation base, and permanent Army post buildings at Miraflores and Gatun. Work was also done for certain individuals and companies in order to care for the housing of employees.

Municipal engineering continued to involve numerous construction projects, including grading, paving, sewer systems, water supply systems, and the like.

Maintenance. By the spring of 1918 the work of dredging had dropped off until the dredges were placed on a single eight-hour shift and the two dredging districts were consolidated. The work had now reached what was practically a maintenance basis, and the Dredging Division was placed under the Engineer of Maintenance.

[72] These buildings included administration and clinics buildings, kitchen and mess, four sections of the ward group, isolation ward, dispensary, medical storehouse, laboratory and crematory, power house, superintendent's home, nurses' quarters and garage.

The work in general was that of keeping the channel clear and of improving it by the removal of spits, angles, and other projections which slowed up navigation. Work was also carried on in enlarging the bays at the base of the slides so that dredges might work against encroaching banks without blocking the channel.

During the fiscal years 1918 and 1919 there was no delay of shipping on account of slides. The number of cubic yards of spoil removed by dredging, apportioned to maintenance and to permanent improvement or construction, was as follows:

CUBIC YARDS OF SPOIL REMOVED

	Fiscal year 1918		
	Construction	Maintenance	Total
Atlantic entrance	.....	19,452	19,452
Gatun Lake	.....	.....	.....
Gaillard Cut	120,000	2,285,273	2,405,273
Miraflores Lake	.....	.....	.....
Pacific entrance	319,880	596,975	916,855
Total canal prism	439,880	2,901,700	3,341,580

	Fiscal year 1919		
	Construction	Maintenance	Total
Atlantic entrance	.....	.....	.....
Gatun Lake	50,000	14,100	64,100
Gaillard Cut	.....	753,800	753,800
Miraflores Lake	.....	.....	.....
Pacific entrance	230,000	1,425,300	1,655,300
Total canal prism	280,000	2,193,200	2,473,200

Maintenance work included not only that involved in keeping the channel clear for traffic but also that connected with the locks and other operating necessities of the canal. That maintenance work on the locks had reached a point of stability, if not routine, is indicated by the fact that during 1918 no delays to ships occurred because of the failure of the operating machinery at the locks and during 1919 the only delay was the result of a blunder by an employee at the control board in flooding the chambers.

Electrolytic action on metals was still causing trouble, but the substitution of green-heart timber for metal, which had been tried at certain valve seats, bid fair to be completely successful and the practice was extended. Replacement of certain fender timbers was

found to be necessary because of the attacks of the teredo, a marine worm. The lead sheathing of electric cables corroded as the result of the seepage of lime-salt laden water, which set up a chemical reaction on the lead, and caused short circuiting.

The application of bitumastic enamel to the metal surfaces exposed to sea water also was successful in checking the corrosion which had previously proved to be so troublesome.

The maintenance work on the auxiliary features of the canal, that is, on dredges, ships, cranes, rolling stock, etc., continued as in previous years. The equipment necessary for this work was available at times for outside use and, as has previously been indicated, was more extensively used each year by private interests. The end of the fiscal year 1919 saw the real initiation of the maintenance and repair service on a commercial basis—the beginning of what were later called the " business enterprises " of " The Canal."

The details of maintenance operations during this period may seem trivial in comparison with the huge tasks previously dealt with, such as the removal of the slides, and in magnitude they are. In importance, however, they may not be ignored. The corrosion of valves, the failure of rivets, the grounding of an electric current, might well cause an accidental flooding of the locks, the collapse of a gate, or the failure of safety devices resulting in an accident as severe in its effect on traffic as a major slide.

Supplies and Subsistence. The general field of control of what may be called the supply work is indicated by the organization divisions which functioned during the war period. These were:

(a) District quartermasters, hotels, restaurants, messes, and storehouses, under the direct supervision of a superintendent, reporting to the chief quartermaster.

(b) Commissary division, operated under a general manager, reporting to the chief quartermaster, and including commissary warehouses, cold storage plants, manufacturing plants, abattoir, laundries, and retail commissaries.

(c) Pastures, plantations, hog farms, chicken farms, and dairies, under the immediate supervision of a superintendent, cattle industry, who has also direct charge of the operation of the cattle boats, and who reports to the chief quartermaster.

(d) Purchase of live stock and cattle, in charge of a cattle buyer, who reports to the chief quartermaster.

(e) United States requisition bureau, under the chief of bureau, reporting to the chief quartermaster.

(f) Printing plant, designated as The Panama Canal Press, and operated under the charge of a printer, who reports to the chief quartermaster.[73]

The quarters problem had become much less troublesome due to reduction in the number of silver employees and the practical completion of numerous housing projects previously initiated.

Tourist traffic was eliminated by the war and the year 1918 showed severe losses at both of "The Canal" hotels. They had to be kept open, however, for the use of visitors having business with "The Panama Canal." The year 1919 saw a revival in South American trade, which was largely responsible for the fact that hotels showed a considerable profit during the year.

Efforts to place the Canal Zone on a self-supporting basis with regard to food continued, with beef-raising, hog-raising, dairy farm, chicken farm, and vegetable plantations all contributing to this end.

The war years showed a reduction in the number and total value of purchases of materials and supplies, dropping from $10,817,106.51 in 1917 to $8,700,356.62 in 1918, and to $7,832,-845.61 in 1919, despite the rapid increase in prices. Sales to other government departments and to commercial interests in 1918 amounted to $1,630,827.60, while in 1919 this figure was $1,777,-516.33. The commodities sold included, as in the past, building material, general hardware, rope, cable, gasoline, kerosene, and lubricating oils. Coal and fuel oils continued as major sales items. The proportion of such outside sales and service, that is, the "business enterprises," to the prime activities of "The Canal" continued to increase. With the succeeding year began the real growth of the "business" side of "The Canal."

Labor. The labor problem proved to be vexatious as in all other government departments. Skilled labor, especially in marine work, was difficult to obtain. Tenders of employment were declined in 60 per cent of cases during the fiscal year 1918, and 40 per cent in 1919. The number of employees on the rolls was as follows:

	Gold	Silver	Total
1918	3,108	16,157	19,265
1919	3,290	17,071	20,361

[73] Governor, Annual Report, 1918, p. 19. The commissaries, cattle industry, pastures, plantations, dairies, etc., and the Washington Hotel were financed by the Panama Railroad, but operated under the supervision of "The Panama Canal."

Sanitation. Although health conditions in and about Central America during 1918 were unsatisfactory, the Canal Zone was kept free from the inroads of contagious diseases. No yellow fever or plague appeared in the Zone, though malaria continued to be prevalent.[74] Cerebrospinal meningitis threatened to invade the Zone but quarantine prevented this. Three cases of smallpox arrived in Panama and two cases of leprosy, but no secondary cases resulted.

In 1919 one case of yellow fever arrived at quarantine but there were no secondary cases. Seventeen leprosy patients were admitted to the leper asylum, while a mild epidemic of smallpox broke out in the interior of the Republic of Panama. No deaths resulted, however, and the Canal Zone was not affected. Malaria increased during this year, due largely to the spread from employees (often native chronic malarial victims) who were tending cattle in unsanitated areas. Special sanitation work was undertaken near coaling plants, locks, and docks, Stringent fumigation regulations for vessels from the west coast were put into effect because of the prevalence of bubonic plague in that area.

The Panama Railroad. The activities of, and the statistics regarding the Panama Railroad during the period 1914-1919 have been included in the previous pages for the sake of comparison and because the war had no vital effect on them. Hence there is no necessity of segregating the fiscal years 1918 and 1919 for further discussion at this point.

Zone Government. The war years saw no changes of moment in the organization or operation of the Zone government. The police continued to coöperate in the apprehension of violators of the Espionage Act and to a minor extent in the protection of canal works. The fire department in 1918 was finally completely motorized.

School enrollment, which had dropped off sharply in 1916, had resumed a steady increase. The number of white pupils was 1764 in 1918 and 1778 in 1919, while the number of colored pupils was 1010 and 1228.

Canal Traffic. The variation in traffic during the war years was, perhaps, less marked than might be expected, though Pacific to

[74] The incidence of malaria in the sanitated districts was 6.77 per 1000, while that in the unsanitated areas was 128 per 1000.

Atlantic cargoes still predominated to a large degree. The figures are as follows:

SUMMARY OF CANAL TRAFFIC, FISCAL YEARS 1918 AND 1919

1918	Ships	Net tons	Cargo tons
Atlantic to Pacific	915	2,736,542	2,639,300
Pacific to Atlantic	1,154	3,837,531	4,892,731
Total	2,069	6,574,073	7,532,031
1919			
Atlantic to Pacific	857	2,673,958	2,740,254
Pacific to Atlantic	1,167	3,451,032	4,176,367
Total	2,024	6,124,990	6,916,621
Grand total	4,093	12,699,063	14,448,652

Vessels of United States registry that used the canal during the years 1918 and 1919 numbered 567 and 784 respectively.

Legislation. During the war years there was practically no legislation specifically applying to "The Panama Canal" with the exception of appropriation acts.

During the fiscal year 1918 nine acts were approved which applied to "Canal" affairs but they were either appropriation acts or they applied to many other divisions of the government as well. Of these nine, four were appropriation acts,[75] one dealt with the matter of trading with the enemy (40 Stat. L., 411), a sixth with the punishment of those guilty of sabotage (40 Stat. L., 533), a seventh amended the naturalization laws (40 Stat. L., 542), an eighth amended the Espionage Act (40 Stat. L., 553), and the last dealt with unlawful entry to or departure from the United States in war time (40 Stat. L., 559).

Executive orders in the fiscal year 1918 numbered thirteen, including two proclamations. Six orders dealt with war regulations, two fixed the compensation of individuals, two amended certain civil service rules, one fixed rates in the Canal Zone, one established a radio station, and one related to navigation rules. A tabulation of these orders and proclamations on the opposite page is included for convenient analysis.

The fiscal year 1919 saw an increase in the number of laws which applied, at least generally, to "The Panama Canal." Twelve

[75] These were 40 Stat. L., 345, 347, 355, 365, 383; 40 Stat. L., 459, 463, 480, 482; 40 Stat. L., 519, 527, 529; 40 Stat. L., 594, 597.

out of fifteen dealt with appropriations and revenues,[76] one provided for the protection of the uniform of friendly nations (40 Stat. L., 821), another conferred upon the President power to prescribe charter rates, requisition vessels, etc., (40 Stat. L., 913), and the last provided for the Fourteenth Census (40 Stat. L., 1291).

Executive orders also increased in number during the year under discussion, eighteen, including two proclamations, being re-

Date	Number	Issued by	Subject matter
Aug. 27, 1917	2692	President	Establishing defensive areas
Sept. 14, 1917	....	Sec. War	Compensation members Joint Land Commission
Oct. 24, 1917	2737	President	Correcting Ex. O. 2692
Nov. 8, 1917	....	Sec. War	Compensation members Joint Land Commission
Nov. 16, 1917	1408	President	Proclamation: Prescribing conduct of enemy aliens
Nov. 16, 1917	2753	President	Amending civil service rules
Jan. 12, 1918	....	Sec. War	Rates of passenger fare in Canal Zone
Feb. 28, 1918	1432	President	Proclamation: Regulation of flying of civilian aircraft
Mar. 25, 1918	2825	President	Establishing military reservation
Apr. 5, 1918	2834	President	Amending civil service rules
May 18, 1918	....	Sec. War	Coördinating purchases with War Industries Board
May 28, 1918	2869	President	Establishing Balboa Naval Radio Station
May 28, 1918	....	President	Anchorage and movement of vessels

corded. Most of them also were of more immediate concern to the proper operations of "The Canal" and the conduct of affairs on the Zone than had been the case in the previous year. Ten were concerned with matters relating to the war, two dealt with navigation regulations, two dealt with tariff or rates, one licensed chauffeurs, one established an aviation station, one amended pay regulations, and the last reinstated an employee. A list is given on page 60.

[76] In order they were: 40 Stat. L., 634, 656, 679, 688, 702; 40 Stat. L., 704, 719; 40 Stat. L., 757, 789, 814; 40 Stat. L., 821, 829, 830, 831; 40 Stat. L., 815, 816, 819, 820; 40 Stat. L., 845, 855, 856, 866; 40 Stat. L., 973, 975; 40 Stat. L., 1020, 1032; 40 Stat. L., 1057, 1130, 1132; 40 Stat. L., 1213, 1243, 1267; 40 Stat. L., 1305, 1307; 40 Stat. L., 1325, 1333, 1335.

The war years show greater changes in the theory of "Canal" control and operation during the war than in practice. With the exception of unusual precautions taken in the early stages of the

Date	Number	Issued by	Subject matter
July 9, 1918	2907	President	Anchorage and movement of vessels
July 26, 1918	2926	President	Navigation rules and regulations
Aug. 8, 1918	1473	President	Entrance or departure of persons during hostilities
Aug. 8, 1918	2932	President	Rules and regulations governing issuance of permits to enter and leave United States
Sept. 4, 1918	....	Sec. State	Designating effective date of No. 2932
Oct. 3, 1918	2968-A	President	Providing funds for mail censorship
Oct. 9, 1918	2971	President	Licensing of chauffeurs
Nov. 4, 1918	2987	President	Establishing air station
Nov. 14, 1918	2993	President	Sick leave to aliens
Nov. 16, 1918	2996	President	Amending rules for pay non-civil-service clerks
Nov. 27, 1918	....	President	Transferring war trade funds for expenditure in Canal Zone
Dec. 23, 1918	....	President	Abrogating rules prescribing conduct of enemy aliens
Jan. 25, 1919	3027	President	Revoking orders concerning defensive areas
Jan. 25, 1919	3031	President	Leave for employees returning from military service
Jan. 25, 1919	3032	President	Terminating control of "Canal" by army
Mar. 4, 1919	3062	President	Amending canal tonnage certificates
May 29, 1919	....	Sec. War	Tariff regulations for passenger conveyances
May 31, 1919	3093	President	Reinstating an individual

conflict to protect canal works from possible damage, there was little, at least superficially, to mark the changed status of affairs.

The Canal of To-day. With the beginning of the fiscal year 1920 traffic and operation for the first time approached normal conditions. Primary construction was completed, the slides were quiescent, auxiliary works were virtually finished, and the "business enterprises" had established themselves. Traffic was ready to resume, or better, initiate, on a normal peace basis. Transit regulation had become smoother and more efficient, maintenance a

simple routine task, sanitation and quarantine matters of mere watchful activity, civil government no more onerous than in any normal American community, and the business enterprises profitably operating concerns.

The work, subsequent to the war, presents itself in a different aspect, or better, with different emphasis than before. This is well illustrated by the classification of activities presented in the annual reports of the Governor beginning with the fiscal year 1921. This classification is here adopted for convenience of discussion and is as follows:

1. Canal operation and trade
2. Business operations
3. Government
4. Administration

The Canal Formally Opened. The canal was opened to traffic on August 15, 1914, with the passage of the S. S. "Ancon," this being, technically at least, merely an informal opening. In order to conform to the provisions of the Panama Canal Act, a formal opening was required, and this was effected by a Presidential proclamation, dated July 12, 1920.

As originally contemplated certain ceremonies were to accompany this formal opening, but nothing other than the issuing of the proclamation was actually done. The entire procedure was a technical conformance, a mere legal gesture.

The story of the primary function of "The Panama Canal," during the post-war years, namely, the passage of ships from one ocean to the other, falls naturally into two main themes: actual transit and trade, and secondly, operation, comprising the technical activities directly responsible for making transits possible.

Traffic. Nothing serves to vizualize the development of canal trade and traffic during the period under discussion so well as a tabulation of pertinent figures. Such a tabulation, accordingly, appears on page 62.

The peace time revival of trade during 1920 and 1921 appears, followed by the drop of 1922 when ocean trade and the business world were at a low ebb in activity. The revival of the past few years also shows clearly.

Another matter of interest in passing is the variation in the average net tonnage of vessels using the canal during the past ten

years. The average net tonnage per ship in 1916 was 3161. It stayed at approximately that figure until 1920 when it began a steady growth that resulted in an average net tonnage of 5000 tons in 1924. The miscellaneous types of ships used during the

SUMMARY OF CANAL TRAFFIC, FISCAL YEARS 1920 TO 1925, INCLUSIVE

	Ships	Net Tons	Cargo Tons
1920			
Atlantic to Pacific	1,180	4,168,873	4,092,516
Pacific to Atlantic	1,298	4,377,171	5,281,983
Total	2,478	8,546,044	9,374,499
1921			
Atlantic to Pacific	1,471	5,740,902	5,892,078
Pacific to Atlantic	1,421	5,674,974	5,707,136
Total	2,892	11,415,876	11,599,214
1922			
Atlantic to Pacific	1,509	6,404,172	5,495,934
Pacific to Atlantic	1,227	5,013,287	5,388,976
Total	2,736,	11,417,459	10,884,910
1923			
Atlantic to Pacific	2,125	10,072,813	7,086,259
Pacific to Atlantic	1,842	8,532,973	12,481,616
Total	3,967	18,605,786	19,567,875
1924			
Atlantic to Pacific	2,740	13,668,049	7,860,100
Pacific to Atlantic	2,490	12,480,829	19,134,610
Total	5,230	26,148,878	26,994,710
1925			
Atlantic to Pacific	2,413	11,889,036	7,398,397
Pacific to Atlantic	2,260	10,966,115	16,560,439
Total	4,673	22,855,151	23,958,836
Grand total	21,976	98,989,194	102,380,044

war when any bottom available was employed regardless of size, are responsible for the low average tonnage of the war years. The 1916 figure, a pronounced drop from the previous year, undoubtedy reflects the results of the great slides. The lighter ship with less draft stood better chance of passage through the channel, and usually the larger ships were diverted. The increase

since 1920 is significant in that it probably reflects the economy of the larger carrier.

The small motor ship, while not an influencing factor, still has an effect on the average capacity figures. The motor-ship traffic has been as follows in number of transits:[77]

1921.....	99	1923.....	121
1922.....	77	1924.....	203
	1925.....	282	

Vessels of United States registry passing through the canal numbered 1129 in 1920, 1210 in 1921, 1095 in 1922, and 1944 in 1923. In 1924 the number was 2947 and in 1925 it was 2326.

The tolls paid by the vessels of the leading carrier nations using the canal during the first ten years amounted to $97,804,818.46, of which United States ships contributed $45,421,836.69.

With the return of peace and the resumption of more or less normal world trade the question of competition in routes faced "The Panama Canal." It was obvious that for certain traffic the canal offered the only feasible route such as the United States coast-to-coast trade, that between the west coast of North and Central America and the Atlantic coast of North America, Europe and Africa as far as twenty degrees south, and the trade between Atlantic ports of Europe and North America and the west coast of South America, except the southern part of Chile.

For many other routes, however, the saving in mileage was much less marked and other factors such as trade connections along the way, fueling costs, weather conditions and the like were potent factors. Such routes, in which "The Panama Canal" was in obvious competition, included those between Australasia and Europe and the Atlantic ports of the United States and the Far East.

With these facts in mind the importance of coaling and fuel oil costs, repairs and supplies, in short the "business operations" of "The Canal" become obvious and showed their integral connection with the primary function of the waterway, namely, the transit of vessels.

[77] These and other figures do not include local coastwise-trade transits of small vessels. For instance, a 69-ton ship plying between Cristobal and Buenaventura, Colombia, which made thirty-six transits in 1921 is excluded from the totals.

In addition to the revenue producing transits numerous ships paying no tolls were passed through each year. These consisted of vessels of the governments of the United States, Panama, or Colombia, which were engaged on official business, and constituted a far from negligible tonnage.

The number of ships passed toll-free through the canal since 1920 is as follows:

1920	267	1923	388
1921	426	1924	418
1922	276	1925	380

The loss of tolls on such ships amounted to a considerable sum. For instance, in the fiscal year 1921, the tolls, which, at commercial rates would have been received from these free-transit vessels had such charges been made, amounted to $924,901.29, and in 1922 to $628,423.24.

As a recognition of the problems to be faced and a repetition of the importance of the "secondary" to the "primary" functions of "The Canal" the Governor's words are quoted:

> Prompt and cheap handling of ships at the canal, in transiting, fueling, provisioning, etc., is an attraction to traffic from alternative routes. Such service would seem to be warranted purely as a means of increasing the revenue of the canal; while, on the other hand, delays and losses to shipping as the result of less than efficient handling are inescapably a burden on commerce and consumption, which should not be imposed.[78]

Measurement of Ships. From the opening of the canal the matter of measurement of ships for the assessment of tolls was a source of continuous complaint and a subject of comment in each annual report. The Panama Canal Act provided in Section 5 (37 Stat. L., 560, 562) that:

> Tolls may be based upon gross or net registered tonnage, displacement tonnage, or otherwise, and may be based on one form of tonnage for warships and another for ships of commerce. The rate of tolls may be lower upon vessels in ballast than upon vessels carrying passengers or cargo. When based upon net registered tonnage for ships of commerce the tolls shall not exceed one dollar and twenty-five cents per net registered ton, nor be less, other than for vessels of the United States and its citizens,

[78] Governor, Annual Report, 1921, p. 5.

than the estimated proportionate cost of the actual maintenance and operation of the canal, subject, however, to the provisions of article nineteen of the convention between the United States and the Republic of Panama, entered into November eighteenth, nineteen hundred and three. If the tolls shall not be based upon net registered tonnage, they shall not exceed the equivalent of one dollar and twenty-five cents per net registered ton as nearly as the same may be determined, nor be less than the equivalent of seventy-five cents per net registered ton. The toll for each passenger shall not be more than one dollar and fifty cents.

The tolls thus permitted were prescribed by President Taft in a proclamation issued on November 13, 1912, as follows:

1. On merchant vessels carrying passengers or cargo one dollar and twenty cents ($1.20) per net vessel ton—each one hundred (100) cubic feet—of actual earning capacity.
2. On vessels in ballast without passengers or cargo forty (40) per cent less than the rate of tolls for vessels with passengers or cargo.
3. Upon naval vessels, other than transports, colliers, hospital ships and supply ships, fifty (50) cents per displacement ton.
4. Upon army and navy transports, colliers, hospital ships and supply ships one dollar and twenty cents ($1.20) per net ton, the vessels to be measured by the same rules as are employed in determining the net tonnage of merchant vessels.

The Secretary of War will prepare and prescribe such rules for the measurement of vessels and such regulations as may be necessary and proper to carry this proclamation into full force and effect.

In order to levy these tolls rules for the measurement of vessels had to be laid down, and this was done by a proclamation issued by President Wilson on November 21, 1913.[79]

Both of the proclamations mentioned were based upon the report of an expert,[80] who had been employed to formulate the rules regulating measurement and tolls. This report evidently had not been brought into accord with existing legislation, and when "The Panama Canal" officers levied tolls based solely upon the "Canal" system of measurement, trouble was experienced. Pacific coast lumber interests challenged the right of "The Canal" to exact

[79] The rules themselves were published as an appended and separate pamphlet; also as Governor's Circular No. 601, p. 2.
[80] Professor Emory R. Johnson, of the University of Pennsylvania.

tolls for deck loads, the lumber trade, naturally, using the decks for additional cargo storage space. The claim was that in accordance with the law, tolls must be levied on the basis of the equivalent of the vessel's United States net registered tonnage.

The decision of the Attorney General in the matter was based on the wording of the Panama Canal Act, namely, that the factor of United States net registered tonnage had to be considered in reckoning and levying tolls. He maintained that tolls might still be levied according to "The Panama Canal" measurements at $1.20 per ton for loaded ships, but that the total amount for tolls collectible on any one vessel might not, legally, exceed the United States net registered tonnage multiplied by $1.25.

This brought into use a second set of rules in order to provide for the dual measurement and levying required. The result was complication, delay, and, if reports are correct, considerable confusion. "Canal" officers claimed that the United States net registered tonnage was not an adequate basis for levying tolls.

The situation was further complicated by the fact that under two sets of rules the same space was likely to receive different classification and treatment; that under existing laws (made with no thought of canal tolls in mind) it was possible for two vessels of exactly the same lines and dimensions to possess different official registered net tonnage, and that particular classes of vessels were permitted options in taking advantage of certain privileges in the classification and exemption of space.[81]

Finally the regulations of the Commissioner of Navigation added their quota to existing difficulties.

The Commissioner of Navigation acting under his prerogative, on March 16, 1915, caused to be issued a circular in reference to the exemption from measurement, under certain conditions, of shelter-deck and closed-in spaces on board ships, which had previously been subject to measurement and charges for Panama Canal Tolls.

It is thus apparent that as long as this holds true, and the United States net registered tonnage must still be considered as a factor in determining Panama Canal tolls, that the Commissioner of Navigation, in reference to this factor, is empowered to arbi-

[81] For an amplification of these statements, see Governor's Annual Report, 1915, p. 218 *et seq.* It was further contended that such variations constituted, by the alleged discrimination resulting from the optional privilege, a clear violation of the Hay-Pauncefote treaty.

trarily decide which spaces in United States vessels shall or shall not be subject to measurement and tolls, and exercises a power which is similar to that vested in Congress and the President in reference to the other factor, namely, the Panama Canal Rules of Measurement.

Another point in this connection is the fact that while the board of admeasurers at the canal decides all questions in relation to Panama Canal tolls, the Commissioner of Navigation in Washington is the final authority on deciding those relating to United States tonnage. It is needless to point out the utter impossibility of prompt administrative action where matters in dispute must be referred to two separate, independent, and distinct heads so widely separated. There can be no question but that there should be but one head, and that at the point of administration at the canal, for the settlement of all claims and disputes. . . .

The position taken by the Governor was:

The Panama Canal Rules of Measurement, taken alone with no dependent factor, are made to apply to all vessels alike, without discrimination as to kind, type, class, or nationality, and are excellent for their purpose, and it is strongly recommended that Congress be requested to eliminate the factor of United States net registered tonnage and base the measurement and tolls solely upon the Panama Canal Rules of Measurement as laid down in the above-mentioned presidential proclamations.[82]

The loss in tolls to "The Panama Canal" for the fiscal years 1916 to 1925 inclusive under the present rules was $21,147,042.29, made up as follows:

1916.....	$390,714.05	1921.....	$1,937,029.04
1917.....	1,034,001.88	1922.....	2,174,044.35
1918.....	1,083,111.69	1923.....	3,322,352.55
1919.....	867,526.48	1924.....	4,450,995.13
1920.....	1,445,117.50	1925.....	4,442,149.62

Total....$21,147,042.29[83]

In 1919 the Board of Admeasurement of "The Panama Canal" had recommended a new form of tonnage certificate, and this form was put into effect as of May 4, 1919.[84]

[82] *Ibid.*, pp. 220-21.

[83] To this total should be added $225,899.61, refunded prior to the close of the fiscal year 1920, and $63,533.03 which remained to be refunded at that time.

[84] Executive order (No. 3062) of March 4, 1919, effective in sixty days. A sample certificate was appended to the order.

Seemingly this did not settle matters to the satisfaction of "The Canal" officers, however, since on May 27, 1919, a report entitled "Memorandum regarding Panama Canal tolls" was issued by the Marine Superintendent,[85] but definite action resulting from this document or from previous agitation does not appear to have come about. The Governor, in his annual reports, continued to protest against the injustice of the dual measurement practice with apparently little effect.[86]

In 1924, however, Congressional action was definitely recorded. Bills were introduced in both House and Senate, providing that "Panama Canal" rules should be the sole basis of measurement for the levying of tolls, but Congress adjourned without acting upon these measures and the settlement of the question remained for the future.[87]

Operation. The activities discussed under the title of "Operation" for the post-war period include only those, broadly speaking, which contributed immediately to or were necessitated directly by the passage of vessels through the canal. These activities include such matters as lockages and lock maintenance, the production and distribution of power for canal operation, maintenance of adequate water supply, dredging and clearing of channel, and maintenance of aids to navigation.

Lock Operation. Lock operation by 1920 had become a routine matter, the technique of which had been carefully worked out through the earlier years' experience. The main problem which presented itself was the dispatching of ships to secure the most satisfactory combination of service to shipping, elimination of overtime, utilization of daylight, and economy of operation.

[85] L. R. Sargent. For memorandum, see 66 Cong., H. doc. 126.

[86] The 1923 report showed the conspicuous example of two ships of exactly the same dimensions and tonnage, with one vessel paying $670 less in tolls than the other because of the difference of location of a small fuel transfer pump. This condition arose not primarily from dual measurement difficulties, but because of interpretations of the United States rules regarding exempted spaces by the Commissioner of Navigation.

[87] These bills were, respectively, 68 Cong., H. R. 7762 and S. 2400. The former was reported out of the Committee on Interstate and Foreign Commerce (April 25, 1924), with a detailed explanatory statement. Published in 68 Cong., H. rep. 573.

The number of lockages through the years had been:

1915	3,676	1920	8,149
1916	2,876	1921	9,602
1917	5,994	1922	8,834
1918	7,034	1923	12,551
1919	6,938	1924	16,352
		1925	14,480

The dimensions of the locks have been the subject of discussion since the average size and tonnage of ships passing through have increased steadily. This tendency, while unmistakable, is said by officers of "The Canal" not to indicate the probable approach of commercial vessels to the maximum size able to pass through the locks, but the increasing use of vessels on this route which attain the maximum economy of operation. The average size of vessels using the canal in the fiscal year 1925 was: length 407.7 feet, beam 52.2 feet, draft 22.8 feet. In no case was the limit imposed by the locks approached by a commercial vessel.

The locks, 110 feet in width, will pass any vessel constructed up to the present time.[88] With the size of warships limited by the treaty for the limitation of naval armaments there is no anticipation that the capacity of the locks will be exceeded by any war vessel during the life of the treaty. When third chambers are constructed to care for growing commercial traffic, "Canal" officers state that an increased width will probably be adopted to provide for future growth in size of ships.

Dispatching. Beginning August 15, 1921, a system of dispatching vessels through the canal on prearranged time schedules was adopted. Previously vessels had been dispatched without systematic effort at spacing other than was necessary to avoid congestion. Often two or more vessels would arrive at the locks at the same time, necessitating the shifting of men from maintenance work in order to make up operating crews, while frequently vessels congregated in the narrow approaches to the locks and were hampered in maneuvering and disturbed by currents resulting from the flooding or emptying of the locks.

[88] The nearest approach to the limiting lock dimensions which has occurred in vessels using the canal has been with warships. The largest battleships of the United States Navy have a beam of 97 feet, 4½ inches. Two airplane carriers under construction have a beam of 106 feet. The British battle cruiser "Hood," with a beam of 105 feet, 2½ inches, passed through the canal in 1924.

The new system permitted a more economical arrangement of working shifts at the locks so as to cover both maintenance and operation, thus having a maximum available force during the expected peak load of the day.[89]

No ship was dispatched unless it could pass through Gaillard Cut by daylight. Decision to operate on a daylight schedule was reached for two reasons; the volume of traffic did not justify the expense of night operation, and the necessity for dredging operations made it advisable to keep the Cut clear at night for "Canal" equipment. The dispatching system mentioned was adopted primarily as an economy measure after studies had been made looking toward a plan which would permit reduction in lock operating forces and at the same time not interfere with the rapid transiting of vessels. A very considerable opposition to this plan arose at first among the steamship companies. The objections died down, as the smoothness of operation increased.

Increased traffic after 1922 required the use of additional electric towing locomotives, which were built in the Mechanical Division shops. Two each were placed at Gatun and at Miraflores and one at Pedro Miguel. During the next year six additional locomotive operators and one general operator were employed at Gatun and five additional locomotive operators on the Pacific locks. 1924 saw a further increase comprising two senior general operators, one control house operator, and five locomotive operators at Gatun and two senior general operators, four general operators, two control house operators, and five locomotive operators at the Pacific locks.[90]

[89] Under this plan vessels arriving at Cristobal inner harbor prior to 1.30 p. m. and at Balboa before 1.45 p. m. were put through the canal the same day. Lockages were still restricted to the daylight hours however. The Pedro Miguel locks continued to operate under two shifts. The operating period for these shifts at Gatun covered the time between 7 a. m. and 11 p. m., at Pedro Miguel from 7.30 a. m. to 7.30 p. m., and at Miraflores from 7.30 a. m. to 9 p. m. These hours were later changed for the last two mentioned to from 7.30 a. m. to 8 p. m. and from 6.50 a. m. to 10.20 p. m., respectively.

[90] The electric locomotives, against which no criticism had ever been leveled except possibly that of expense, continued to justify their design by successful operation. No accident to any ship occurred because of a towing locomotive failure, a further justification, as their prime function was that of a safety device.

These increases in force were made despite the new dispatching system which had been designed to save labor. Obviously traffic was rapidly increasing.

Various peak loads occurring during the period under discussion illustrate the transit capacity and dispatching facility, of the canal.

On January 19 and 20, 1921, the Atlantic Fleet of the United States Navy made the transit. The first of the ships, a destroyer, entered the canal at 6.18 a. m. on the 19th and the battleship *Oklahoma,* last of the ships for the 19th, entered at 5.20 p. m. Thirteen naval vessels completed the transit that day, and six, which were the battleships, remained in Gatun Lake over night. On the 20th at 7.25 p. m., the last of the fleet completed the transit. In those two days a total of 32 naval vessels and 9 commercial vessels made the complete transit from Atlantic to Pacific, and 2 commercial vessels from the Pacific to the Atlantic. The crux of the situation was at Gatun locks, which made 18 lockages in 14 hours 50 minutes on January 19, handling 20 naval vessels, 8 commercial ships, 1 commercial launch, and 1 tug. Among the naval vessels were the battleships *Arizona* and *Pennsylvania,* with a beam of 97 feet, only 13 feet less than the usable width of the locks.

On the return north of the Atlantic Fleet, February 23, the crux was again at Gatun locks, where the west chamber had been unwatered while repairs were being made. Working one chamber only, 17 lockages were made in 20 hours, with a waiting interval of 2 hours and 20 minutes, or actual operating time of 17 hours 40 minutes. During this time 24 naval and 4 commercial ships passed through the locks.[91]

In 1922 no serious test of lockage capacity was recorded, but "A record was established at Gatun on May 25, 1923, when 24 commercial seagoing vessels were put through in 23 lockages. On February 15, 1923, 38 vessels passed through the locks at Gatun, but this total included a number of destroyers and submarines locked through in groups."[92] The next year, 1924, developed another peak load.

"The Pacific Fleet, consisting of 65 vessels, including 9 battleships, was locked through the canal northbound on January 16, 17, and 18, and 36 commercial vessels were handled on the same dates, making a total of 118 vessels in three days. Returning from maneuvers in the Atlantic, the fleet again passed through the canal, southbound, in April. From April 4 to April 8, inclusive,

[91] Governor, Annual Report, 1921, p. 14.
[92] *Ibid.,* 1923, p. 10.

66 naval vessels completed the transit, together with one other Government vessel and 78 commercial vessels, or a total of 145 vessels in five days.

To pass the fleet and a normal volume of commercial traffic at the same time necessitated some overtime at the locks and in the marine division; with the present organization it was equivalent to a peak load, but well within the canal's maximum capacity both as to personnel and equipment.[93]

Accidents. In spite of increased traffic the accident and delay rate remained low. Four collisions with fender chains have been recorded in recent years, and in each case the chains functioned properly, saving the gates. The cases are interesting:

The chain fenders were called upon to operate in one emergency during the year, this accident occurring at Gatun when the United States destroyer *Satterlee* was rammed by the destroyer *Mason,* parting all lines on the former and pushing her ahead about 300 feet and against the chain fender. The fender functioned properly, stopping both ships, although the bow of the *Satterlee* was opened up at the point of contact with the chain.[94]

* * * *

On May 25, 1923, at Gatun, the S. S. *Hoven,* northbound, and moving at a speed of about four miles an hour, struck a fender chain, as the result of the misunderstanding in the engine room of a signal from the bridge. The chain functioned properly and stopped the ship within 50 feet, preventing a collision with the upper guard gates. No damage was done to either ship or chain mechanism.[95]

The third case was in December, 1923, when a ship tying up at Miraflores locks struck the fender chain and, as in former cases, was stopped without damage to the gates.

The fourth case, in December, 1925, was that of a destroyer, which, after a mistake in engine room signals, struck the fender chain. The chain met the stem near the top, slid over the nose and swept the deck as far as the first gun where the carriage stopped it. The chain functioned properly and there was no damage to lock mechanism.

More serious accidents to shipping both in the locks and along the channel have also been held to a minmum, the delay to traffic

[93] *Ibid.,* 1924, p. 11. Water supply, not here mentioned, is also a pertinent factor in estimating maximum capacity.

[94] *Ibid.,* 1921, p. 16.

[95] *Ibid.,* 1923, p. 11.

from such causes being negligible except to the particular vessels concerned. A summary of accidents during the past few years, listing only those of sufficient importance to require investigation, follows:

	1921	1922	1923	1924	1925
Struck banks	5	1	3	5	10
Struck lock structure, etc.	12	2	3	4	5
Docking accidents at piers, etc.	8	....	....	3	13
Grounded	....	....	....	2	3
Collisions between ships	3	3	1	6	6
Damages by lock action	1	....	....	....	....
Damage from maneuvering tug	8	....	2	....	....
Miscellaneous	2	4	1	2	13
Total accidents to ships	39	10	10	22	50
Total commercial ships handled.	2892	2736	3967	5230	4673

Of the investigated accidents in 1921, "The Canal" assumed total or partial responsibility in twenty cases, the total cost thereof amounting to $11,385.57. In 1922 "The Canal" was obliged to assume liability in but three cases of any moment, amounting to $19,548.15, while in 1923 but one important case involved liability, this to the extent of $9000, one-half the estimated damages. Again, in 1924, but one important case was recorded and in this "The Canal" claimed damage to its property amounting to $10,000, but accepted one-half this amount in settlement.

The year 1925 showed a great increase in accidents but in only one case was "The Canal" held responsible and then to the extent of $1000 only.

The accident rate, thus, has been extremely low, the record constituting a reasonable justification of the elaborate safety device installations, including guard gates, fender chains, and towing locomotives, and of the navigation rules and dispatch schedule which have been adopted.

This brief record of the prime activity of "The Canal," from 1920 on, that is, the passage of ships through the locks and channels, shows the general smoothness and dispatch which has been attained. The early fears of sea-level advocates, that the lock-type of canal would offer continuous and serious delays in operation, seem to have been ill founded.

Maintenance. Closely connected with the matter of lock operation has been that of lock maintenance. The experience of the past

few years in this field is of interest as showing, the degree of routine proficiency to which this activity has attained.

A policy of unwatering the locks at three-year intervals was originally adopted as necessary to adequate inspection and maintenance, it being so arranged that alternate locks would be unwatered at the same time, thus causing no interruption to traffic. Later this interval was lengthened.

Inspection of the various under-water mechanisms and parts of the locks revealed troubles similar to those found at previous inspection, but in lesser degree. The pitting, rusting, and corroding of rivets, straps, valve-seats, castings, and the like, continued, but the application of certain types of paint and enamel had greatly reduced the degree of breaking down.

At other points, as has previously been described, wood was substituted for metal. This also made for improvement, although the teredo attacked the wood under certain conditions. The eating away of lead sheathings by sea water leakage was also eliminated. A new source of trouble was discovered, however, when ants ate through certain cable insulation.

Delays to shipping because of mechanical failures at the locks have been negligible. In the fiscal year 1920 the total delay from such causes, in the passing of 3047 vessels, was four hours and twenty-six minutes, while in 1921 and 1922 the delays were too trivial for record. In the fiscal year 1923 "At Gatun there were nine delays in lockages of more than ten minutes' duration due to faulty operation or failure of equipment, the time thus lost aggregating five hours and four minutes. At Pedro Miguel and Miraflores there were only minor delays due to the breaking of towing cables, bitts, or chocks."[96] During the next two years delays to shipping again were negligible.

The unwatering of locks for inspection and repairs, previously mentioned, has placed one chamber or another of each flight out of commission for the following number of days:

	Gatun	Pedro Miguel	Miraflores
1920	....	44.0	38.0
1921	101.0	46.0	....
1922	....	....	131.0
1923	15.5	94.0	....
1924	41.0	....	....
1925	....	....	59.0

[96] *Ibid.*, 1923, p. 11.

Dredging. An essential to the safe and proper navigation of the canal was the maintenance of a channel of adequate width and depth. Once the prism was completely excavated the maintenance of this prism at its proper dimensions became, in theory at least, a matter of routine dredging. In practice, however, as has previously been outlined, the slides necessitated an excavation program (both dredging and in the dry) which amounted to what was practically a major construction problem, and these difficulties continued. While no slide of the disastrous proportions of that of 1915 has since occurred, traffic has been blocked in recent years by slides of varying seriousness.

In the fiscal year 1920 Cucaracha Slide renewed its activity, as did a small section at East Culebra. The latter proved to be unimportant, but at Cucaracha, on February 21, a general movement occurred, carrying large masses of earth and rock into the channel. This gave intermittent interruptions of short duration to traffic during February, March, April, and May. During this period twenty-seven ships were delayed for a total of fifty-four ship days, the maximum delay to any one ship being four days.

During this movement of 1920 some of the hard rock that had sheared off the south face of Gold Hill years earlier, when the softer rock under its mushroom-shaped top had given way, was pushed out into the channel. The dredges could not move a mass of large pieces or a single piece which lay close to mid-channel and measured 60 feet in length, 30 feet in breadth, and 20 feet in depth, with 25 feet of water over it. This was the size of a large 2-story house, and under 25 feet of water. The drill barge *Teredo* was placed over this rock at 7 o'clock one evening. She drilled it, charged it, and blasted it in one 8-hour shift. At 7 o'clock the next morning the two dredges tackled it and by 5 that evening it was all in barges on its way to the dump.[97]

By June 12 the channel had been restored to full dimensions.[98]

On July 14, 1921, a slide at Gaillard Cut carried sufficient material into the prism to leave a channel only 120 feet wide and 30 feet deep along the west bank. This occurred, fortunately, after the day's traffic had passed. One dredge was in operation within

[97] Morrow, Maintenance and operation of the Panama canal, p. 18.

[98] Slides at this point had always been free from the phenomenon of the "push up" of the bed of the canal, noted at Culebra.

fifty minutes and another within a few hours. By July 15, a channel had been dredged of sufficient dimensions for three of the largest American battleships to pass through.

This illustrates the necessity for keeping in reserve dredging equipment in excess of ordinary maintenance needs, for "The maintenance of channel work requires a readiness that can be likened to that of a fire department. Ordinary silting could be cared for in routine manner, but the slides are always a potential menace to brief closures, and only the most prompt measures are a guaranty that we can keep the channel open at all times."[99]

No further movement of any importance occurred until December 21, 1922, when a major slide appeared at East Culebra which poured 150,000 cubic yards of material into the channel with an additional 450,000 cubic yards into the adjacent basin. The slide at West Culebra began to move simultaneously. By the time the next day's traffic was scheduled to pass through, a channel 150 feet wide and 35 feet deep had been dredged. But one ship was delayed and that for one day.[1]

Slides were active again in the fiscal year 1924, seven different areas being affected at various times. Six of these were of minor importance, but those at West Lirio proved to be more formidable. The first movement at this point occurred in October, followed by other movements late in November which reduced the channel to a width of one hundred feet and a depth of thirty-four feet. This caused a temporary delay to two ships, one because of deep draft and the other because of bad handling qualities. By November 27, the channel had been cleared to a point where a ship drawing 35.5 feet of water, as deeply laden a vessel as had traversed the canal up to that time, was passed by the slide. The slide resumed activity on December 15, and again on January 4, 1924, but these subsidences proved to be so gradual that the dredges could keep pace with them.

The technique of handling slides had been changed in no way since construction days, the procedure calling for the dredging away of the toe of the slide as it encroached upon the channel

[99] Governor, Annual Report, 1921, p. 18.

[1] This ship, drawing thirty-four feet of water, could have passed through, but it was considered advisable to wait until a greater depth than thirty-five feet had been reached.

until the material had reached an angle of repose. Supplementing this was continuous work on the installation of surface drainage and the sealing of peripheral cracks by mean of hydraulic grading.

The slides, obviously, increased the cost of maintenance, not only because of the dredging or excavation involved but also because of the necessity of keeping in commission excess dredging equipment available for emergency service.[2]

Channel Improvements. Some of the dredging equipment had been used, when not in operation against the slides, to further certain improvement projects. Such projects consisted in the main of widening the channel at various points to improve alignment and cutting off spits or points at bends in the canal to make navigation easier. While most of these improvements looked toward preparing the channel for a maximum traffic which would involve night transits, the dredging served to keep in productive operation equipment which otherwise might have lain idle awaiting the call to a slide. Of the projects under way those at Miraflores, Gibraltar Shoals and La Pita Point had been completed by the end of the calendar year 1924. As a consequence twelve new improvement projects were studied and the dredging service was authorized to undertake them in the order of their importance and as conditions permitted. The first of these projects, the deepening of the Pacific entrance and Balboa Harbor to a ruling depth of fifty feet mean sea level, was initiated in July 1924.

An example of the type of preventive work carried on in connection with the slides may be of interest.

To prevent the further disintegration of the high banks through seepage various lagoons and swamps on either side of the Gaillard Cut were filled in, slopes were graded, and new drainage ditches cut. The year's work under this head included 5230 linear feet of ditches, involving the removal of 11,897 cubic yards of material; 445,275 cubic yards of material placed in fills or moved in slope work; and 9000 cubic yards of material handled in cul-

[2] The original dry excavation through Gaillard Cut was made with a more or less uniform slope to the banks, and while slides were anticipated in some portions it proved to be more economical to remove them by dredging and thus obtain the angle of repose than to attempt to anticipate the slides and include this excavation in the original construction program.

vert construction. A pipe-line dredge, a hydraulic grader, and hand labor were used in this work.[3]

The dredging on new construction amounted to the following number of cubic yards:

1920	17,800	1922	105,700
1921	44,700	1923	541,600
	1924	499,600	

Silt Removal. Routine dredging to remove channel silt (in distinction to the removal of slides and the constructive channel work) was of such ordinary nature as to require no further comment. However a tabulation showing the magnitude of the dredging operations, in cubic yards, may be of interest.

	1920	1921	1922	1923	1924
Atlantic entrance	.....	596,400	.....	.....	192,400
Gatun Lake	7,400	111,900	.....	34,400	.....
Gaillard Cut	2,121,710	2,076,600	1,436,300	1,955,300	3,194,800
Miraflores Lake	.....	586,300	.....	17,600	.....
Pacific entrance	1,564,900	664,700	2,491,600	1,450,050	736,100
Total	3,694,010	4,035,900	3,927,900	3,457,350	4,123,300

In addition to maintenance and construction work in the canal prism the dredging program called for maintenance of the approach channels to the terminal docks and coaling plants at the canal entrances, and production of sand and gravel for construction uses from the bed of the Chagres River or at Chame Point on Panama Bay. Such auxiliary dredging reached the following totals, in cubic yards, in the fiscal years indicated:

1920	1,038,876	1923	1,031,553
1921	1,577,172	1922	122,100
	1924	484,150	

Aquatic Plants. While the principal hindrances to the maintenance of the channel were silting and slides, a third problem created by aquatic plants, faced the maintenance organization. These plants (principally water hyacinths) continually menaced the channel in the fresh water of Miraflores Lake. They grew rapidly, and had they been left unchecked would shortly have impeded navigation. Monthly inspection was made of the waters of the canal, Gatun Lake, and tributaries. All scattered plants were

[3] Governor, Annual Report, 1924, p. 17.

pulled, and those in beds destroyed by spraying with a solution of arsenic and soda. In the fiscal year 1920 some 2,500,000 plants were pulled and thrown on shore and 403,500 square yards of plants in beds were destroyed by spraying. In 1922 over 7,000,000 plants were destroyed.

In 1920 a floating variety of hyacinth appeared and proved to be much more difficult to control than the anchored plant. Log booms were placed in various tributary streams and at the mouths of the Mandingo and Chagres rivers to prevent water plants from being washed into the canal by freshets.

Water Supply. Accurate knowledge of available water supply is of great importance in determining the capacity of the canal.[4] Careful and continuous studies of probable rainfall, watershed capacity, and impounding possibilities, begun before construction of the canal, were continued permanently. Extensive data were gathered and studies were continued on three separate phases of the problem; water necessary for lockages, water necessary for electric power, and the development of further sources of supply.

The consumption of water resulted both from wastage and utilization. Included in the former were spillway discharge, leakage, and evaporation; in the latter, the production of hydroelectric power, lockages, and municipal and miscellaneous uses. The relative consumption from these various processes in the calendar year of greatest consumption from Gatun Lake (1925) was as follows: Spillway discharge, 38.9 per cent; hydroelectric power, 29.1 per cent; lockages, 19.1 per cent; evaporation, 12.5 per cent; municipal and miscellaneous, 1.6 per cent.

On the average, over the years, about 51 per cent of consumption has resulted from discharge over the spillway at Gatun. The maximum elevation at which water may be maintained has been +87 (that is, 87 feet above sea level), this level being fixed by the design of the locks. Hence the excess water, which would result in raising the level above 87 feet, during the eight months of surplus water supply has necessarily been allowed to run off.[5] The

[4] The water used to fill the locks is obtained wholly by gravity—that is, fresh water drawn from Gatun Lake, which in turn is the basin for the neighboring watershed. No pumping is done except in connection with the municipal supply.

[5] During the four dry months the flow of water into Gatun Lake is sometimes consumed by evaporation alone.

minimum elevation which would maintain the required forty-foot depth in Gaillard Cut was eighty, therefore, seven feet of water has had to supply all needs for approximately four months of the year.

Evaporation was beyond control and leakage was negligible,[6] hence conservation of excess supply had to be resorted to, if provision for future increases of consumption were to be made. An adequate solution of this problem by impounding in a higher supplementary reservoir lay at hand, namely, the damming of the Chagres River above Alhajuela, which had been proposed in the original plans.

A survey of this tract was therefore put under way during the fiscal year 1920 and completed in July 1923. It was found that with the 260-foot contour line as a limit over twenty-one square miles of watershed was included. The storage capacity of this basin filled to elevation 240 was found to be approximately 22,000,000 cubic feet. Upon completion of the survey action was taken at once.

To forestall any further development of this land, which will ultimately be flooded, the entire basin below the 260-foot contour, together with a small tract below the dam site, was transferred from Panama to the United States as provided in Article II of the Hay-Bunau-Varilla treaty and incorporated with the Canal Zone, effective February 1, 1924. There are two small villages, El Vigia and San Juan, and various scattered huts and clearings within the area of the proposed lake. The number of inhabitants is estimated at 1500. These people will remove to other sites, but they will not be evicted for the time being, and while they remain the necessary public services, including police and schools, will be maintained by the Government of the Canal Zone. Negotiations are now pending to extinguish all private claims to land and improvements within the area.[7]

The construction of the Alhajuela storage reservoir was expected to secure an adequate water supply, but its prospective completion involved at least two other important advantages. First it would provide facilities for a hydroelectric plant supplementing the present generating plant at Gatun, with the additional advan-

[6] In 1922, for example, leakage *plus* municipal consumption amounted to nine-tenths of one per cent of total consumption, and in 1925, 1.6 per cent.

[7] Governor, Annual Report, 1924, p. 13.

tage of passing the water on into Gatun Lake where it could again be used for other purposes.[8] The second advantage lay in an incidental flood control or alleviation, resulting from the impounding facilities. The need for this was illustrated especially during the floods of 1923, when ships were held up for a total of over nine hours.[9]

This delay was due in part to the strong currents at Gamboa, where the waters of the Chagres River reached the canal channel. The violence of these currents would undoubtedly have been greatly reduced, if not eliminated, had a reservoir with sufficient retarding storage capacity existed above Alhajuela, although less in this particular case because, while the flood was the greatest recorded since 1909, it was caused principally by rainfall on the lake and run-off in the Canal Zone proper rather than by excessive run-off from the Chagres watershed above the proposed dam.

Measures to preserve proper water level, other than the construction above discussed, were taken from time to time. A steam-electric generating plant was constructed at Miraflores to take over all or part of the work from the hydroelectric station at Gatun in case of a breakdown or during a period of low water. This plant was held in reserve and ready for immediate operation at any time, making on the average an additional 25 to 30 per cent of the dry-season storage water of Gatun Lake available for lockages.

A water conservation study, undertaken during the fiscal year 1923, resulted in the following conclusions:

> Experiments were undertaken in the economical use of water, which indicated that approximately 2,250,000 cubic feet can be conserved monthly by substituting the Miraflores steam generating plant for the hydroelectric plant at Gatun, and that with the same volume of traffic as in December, 1923, approximately 1,000,000,000 cubic feet can be saved monthly at the locks by crossfilling, short chamber lockages and other like expedients. During a five months' dry season this total conservation of 3,250,000,000 cubic feet a month would amount to 16,250,000,000 cubic feet, or the equivalent of 3.5 feet of storage in Gatun Lake.[10]

[8] The water at the Gatun generating station flows into the sea after passage through the generators.

[9] Nineteen ships were held up on October 23. Thirty-four ships made the transit on October 24.

[10] Governor, Annual Report, 1924, p. 13.

The results of general studies, taking into consideration the measures above mentioned and the projection of possible future traffic, indicated that without additional locks the canal would be able to care for all traffic and meet all demands placed upon it for the next thirty years.

The experience of "The Canal" with regard to rainfall and water consumption is here presented for the fiscal years indicated:

WATER AVAILABLE AT GATUN LAKE

Source	1920 Billion cubic feet	1921 Billion cubic feet	1922 Billion cubic feet	1923 Billion cubic feet	1924 Billion cubic feet
Run off above Alhajuela	50.37	68.74	85.38	68.35	83.94
Yield from land area below Alhajuela	62.88	79.35	91.69	77.24	95.65
Direct rainfall on lake surface	28.05	35.91	42.47	34.58	46.05
Total	141.30	184.00	219.54	180.17	225.64

WATER CONSUMPTION FROM GATUN LAKE

Process	1920 Billion cubic feet	1921 Billion cubic feet	1922 Billion cubic feet	1923 Billion cubic feet	1924 Billion cubic feet
Evaporation	23.93	20.55	19.51	19.54	18.24
Gatun Lake lockages	19.24	22.44	21.14	29.93	37.77
Hydroelectric power	41.83	51.44	45.24	41.56	37.82
Spillway discharge	65.20	81.06	126.41	89.68	126.58
Leakage, municipal, and miscellaneous	1.96	2.21	1.59	1.99	1.59
Increased storage	—10.86	+6.30	+5.65	—2.53	+2.82
Diluting salinity Miraflores Lake	....	....	....	....	0.82
Total	141.30	184.00	219.54	180.17	225.64

The figures for available water vary according to dryness of the year and can only be enlarged by additional impounding facilities which will carry storage from a wet year into a dry one. Consumption figures are more interesting. Evaporation figures remain relatively constant, varying according to the level of Gatun Lake and to the proportion of clear or cloudy weather. Spillway waste also, until additional impounding is possible, varies largely according to rainfall, though the increase of lockages and hydroelectric power production has some effect. Lockage consumption has increased steadily, with a sharp rise in 1923 and 1924, directly reflecting increased traffic. On the other hand, hydroelectric power consumption has fluctuated, reflecting the use of the

auxiliary steam plant, especially in the dry season. Leakage and municipal use have remained more or less stationary. Since in all probability municipal consumption has increased or remained constant, reduction in leakage appears to have been considerable.

Power Generation. Intimately connected with the matter of water consumption has been the production of current by the hydroelectric plant at Gatun, and the auxiliary steam plant at Miraflores. The generator output of the combined stations by average kilowatt hours per month has been as follows:

Fiscal year	Average generator output in kilowatt hours per month	Transmission and distribution losses per cent	Average cost distributed power in mills per kilowatt hour	Oil consumption steam plant average barrels per month stand-by service
1920.....	5,382,750	14.40	9.421	2,311
1921.....	5,958,660	16.23	8.886	2,313
1922.....	4,856,905	15.65	10.500	1,762
1923.....	4,442,920	14.15	8.700	1,362
1924.....	4,688,472	14.50	10.700	[a]1,000

[a] This figure is for stand-by service and does not include 50,000 bbls. used during January, February and March, when the steam plant was operated on the basis of an auxiliary generating station.

This table shows no distinct trend except the reduction of consumption of fuel oil at the steam plant, which reflects the addition of minor equipment and improvements in operating methods rather than variation in load. The saving in fuel did not result in a decrease in the cost of power because of increase of labor and maintenance costs, the latter on aging equipment.

The load carried by the steam plant has varied greatly from year to year, depending on rainfall, lockages, and breakdowns. In 1920 during the three dry months the steam plant relieved the hydroelectric station of an average load of 3000 to 4000 kilowatt hours daily, but in 1921 the dry season did not necessitate any transfer of the load. Again, during 1922 the steam plant was maintained wholly for "stand-by" or reserve service, taking over the load in emergency on fifteen occasions, and under similar conditions in 1923 on thirty-six occasions. In 1924 the major portion of the current was generated at the steam plant during the first two months of the year, in addition to which emergency loads were carried on forty-four different occasions.

Aids to Navigation. Another concern of "The Panama Canal" directly related to the passing of ships from ocean to ocean has

been the provision of aids to navigation, consisting of markers, range lights, buoys, lighthouses, and the like.

Lighthouses were provided at Roncador, Serrana Bank, Quita Sueno, Isla Grande, Toro Point, and East Breakwater on the Atlantic side and at Taboguilla, San José, Bona and Flamenco Islands, and at Punta Mala on the Pacific.

In 1921 two new lights were added at East Breakwater, one visible sixteen miles at sea. At this time, in the canal proper there were eighty-five beacons, seventy-three gas buoys, and seventy-six spar buoys in addition to 108 electric lights in Gaillard Cut. The Flamenco Island light, a lamp of 18,500 candlepower visible twenty miles at sea, was put in commission in 1922, when two range lights were also constructed for the Army at Margarita Point. "The Canal" in 1923 renewed arrangements with the Department of Commerce whereby the former was to attend to the upkeep of the latter's unwatched lights at Serrana, Roncador, and Quita Sueno. In 1924 new buoys and lighted spar beacons were installed, and twenty-seven new bank lights were placed in Gaillard Cut.

These details are important only as they bear upon the preparation for future night transits of the canal at the time when traffic necessitates it; a period preceding by a few years the ultimate installation of increased lock capacity.

Business Enterprises. The second great division of "Canal" activity after 1919 includes the business operations which are a continuation of services initiated during construction, and differ in no essential during the post-war years from the previous years. They have, however, been separately handled and recorded during the past five years, largely for accounting purposes.

Salvage Work. The matter of assisting and salvaging stranded or disabled vessels arose early in the history of "Canal" operation, but it was not until the fiscal year 1921 that special equipment for such operations was available and the policy with regard thereto was stated. Then a Salvage Section was organized which took over the wrecking tug "Favorite" which had been obtained from the Navy in 1920, together with all other available salvage equipment. Headquarters were established at Gatun Lake, where calls to either ocean could be answered with equal facility. Service was maintained with a skeleton organization of experi-

enced salvors, supplemented by men drawn from other work as emergency demanded.

As early as June 20, 1920, the Governor had issued a circular requesting employees engaged upon salvage work not to institute libel proceedings before consulting with him. This circular was followed by another on February 21, 1921, which, in effect, laid down the salvage policy of "The Canal":

Quite recently the Governor has had a request from an employee for permission to libel a vessel which caught fire while lying at a pier in the harbor of Balboa. This employee was on duty at the time he proceeded to the assistance of the vessel, although not on duty with reference to that vessel.

It is the belief of the Governor that all employees of The Panama Canal should be considered available for such emergency work as is involved in rendering assistance to a vessel on fire within the confines of the port of Balboa without laying the vessel liable to libel for salvage. The Governor considers that all shipping within the canal prism, or, to be exact, within the limits marked by the sea buoys at Balboa and the breakwater at Cristobal, have a right to expect any assistance from the equipment and personnel of The Panama Canal which is necessary for their proper care, preservation, and handling in Canal Zone waters.

He believes that the equipment of the Canal Zone is maintained for the above purpose; and that the reputation of the canal for fair dealing requires that the above viewpoint be insisted upon and maintained. In view of the above, the Governor will not approve in future any proposal to libel vessels for assistance in emergencies within the canal waters; and if any such libel is placed by a canal employee it will be considered that such employee has taken action which is inimical to the best interests of the canal, even though such action technically be within the law.[11]

Salvage work, therefore, became primarily a matter of "Canal" service, and thus discussion of the subject may perhaps be placed in the same category as other major "Canal" activities. For the performance of salvage work "The Canal" equipped two ocean going tugs for towing, one stationed at Cristobal and the other at Balboa. In addition, a wrecking tug was maintained.

The business basis upon which the salvage service was operated is well stated in an annual report:

The Panama Canal will undertake salvage operations either on a per diem basis for the use of the equipment, a fixed price for

[11] *Ibid.*, 1921, p. 20.

the job with graduated reimbursement in case of failure or partial success, or on the basis of "no cure, no pay." The salvage section is maintained for service rather than for revenue, and whatever form of contract owners or underwriters may prefer the efforts of the wrecking crew will be to do quick and efficient work consistent with the canal's reputation.[12]

The individual examples of salvage service operations need not be detailed. They ranged from the simple towing of disabled vessels for short distances to major and difficult salvage operations, during which the attendant vessel might stand by for two months or more. In some cases ships were towed as far as Mobile, Ala., and in one case a "Canal" tug assisted a ship 900 miles away and towed her to the port of her choice, a distance of over 1900 miles.

Mechanical Shops. The mechanical shops, which take care of ship repairs, were constructed for a dual purpose: the upkeep of "Canal" equipment and plant and the rendering of service to shipping. This program was adhered to, and the policy of giving service to private interests continued after 1919 as before. The practical necessity of this, eliminating all other considerations such as the maintenance of excessive plant and equipment for possible emergency Navy use, the overhead for which could be reduced in times of peace by giving service to private shipping, was illustrated by the fact that the nearest point to the canal where a large ship could be dry-docked and repaired was 1800 miles distant. Also, few docks anywhere had dimensions as great as 1000 by 110 feet.

The value of work performed, by types and the proportion of each type to the whole for the past few years is informing:

Monetary Value of Mechanical Work Done in Canal Shops, by Type

Class	1921	1922	1923	1924
Marine[a]	$4,051,475.82	$1,364,483.22	$1,105,498.32	$1,787,869.78
Railroad	1,068,160.43	533,172.70	441,882.69	488,324.86
Miscellaneous	952,911.07	408,020.35	534,246.93	374,498.57
Mfctr. for stock	750,701.10	342,399.16	208,598.11	301,098.04
Total	$6,823,248.42	$2,648,075.43	$2,290,226.05	$2,951,791.25

[a] Includes "Canal" and Navy floating equipment.

[12] *Ibid.*, 1922, p. 14.

Similar figures classified by organizations for which the work was done follow:

VALUE OF MECHANICAL WORK PERFORMED IN CANAL SHOPS BY RECIPIENT OF SERVICE

For whom performed	1921	1922	1923	1924
Panama Canal	$2,354,519.46	$953,653.70	$102,158.91	$1,106,576.84
Panama Railroad .	1,387,178.45	636,571.09	458,952.04	513,165.34
Other government departments	394,014.15	136,984.12	286,724.28	234,798.59
Individuals and companies	2,687,536.36	[a]920,866.52	[a]522,960.82	1,097,250.48
Total	$6,823,248.42	$2,648,075.43	$1,370,796.05	$2,951,791.25

[a] Including the Panama Railroad Steamship Line.

The commercial business of the repair shops and docks included work done for individuals and companies and differed in no way from such work performed for "The Panama Canal" itself except in the matter of charges. It included dry docking, scraping, painting, patching, repairing, replacements, machining, and installation of new equipment.

These activities were at a peak in 1920, when the revenues from such services amounted to $5,210,623.06. The next year, showed a drop to $4,900,228.20, reflecting the general shipping depression and the reduction of appropriations to government departments. The labor force was reduced to correspond with the restriction of activity.[18]

In connection with the falling off of business and the reduction of force and its meaning with regard to "Canal" equipment, the Governor spoke as follows:

The present volume of business is insufficient properly to support a mechanical plant the size of that on the Isthmus, and the decrease has resulted in a reduction of personnel beyond the point which is proper for a permanent force. In normal times the business from commercial shipping will carry the operating and maintenance charges of these shops, but under conditions existing at present this is not true. So far as possible, the routine repair work of The Panama Canal and the Panama Railroad has been distributed so as to come at times when other work was slack, and this

[18] The total force on July 1, 1920, was 2856, and on June 30, 1921, it was 1835. The gold roll on July 1, 1920, was 1003, and 644 on June 30, 1921.

has helped materially to hold the force together. A shop plant is necessary for handling repair work for the canal organization; and shops of the present magnitude are essential for a proper handling of repairs to commercial shipping and the vessels of the Navy that may call here. So far as is possible this business is made self-supporting and it has been so up to the present, but the necessity for maintaining here proper facilities for naval vessels should be considered in connection with a study of the work done in past years and of the conditions that confront this in common with all marine repair establishments, during the coming year.[14]

In spite of the heavy overhead charge which it involved, the policy of maintaining "The Canal" not only as a waterway but also as a maritime service station was continued.

The mechanical shops demonstrated their ability to handle adequately and economically almost every form of ship repair and replacement at one time or another. A recital of individual jobs is unnecessary, but a few of special significance may be mentioned.

In 1920-21 the Shipping Board vessel *Marne* damaged by several fires and explosions and finally sunk by shell fire to extinguish the blaze, was raised, rebuilt, and reconditioned. Work was performed on practically every part of the vessel, taking nearly eight months and costing over $700,000. In 1922 the steamship *Panama* was overhauled and reconditioned for the Panama Railroad steamship line, the job involving the installation of new boilers and extensive work on hull, machinery, and superstructure. In the same year a difficult and delicate job in straightening the bent crank shaft of a ship was also carried out successfully. Extensive work for the Panama Railroad steamship line ship *Colon* was begun the next year, while an intricate and unusual electric welding job on the wrecked low-pressure cylinder of another vessel was successfully completed. The latter involved the newest methods and was completed in one-fourth the time that older procedure would have required. During 1924 the work on the *Colon* was completed and the vessel sold to the Alaska Steamship Corporation.

The work for Army and Navy ships differed in no way from that for individuals and companies except that it was less in volume. Needed maintenance, repair, and construction work was carried on

[14] Governor, Annual Report, 1921, p. 24.

in connection with all types of ships from submarine patrol to superdreadnought, much of it being on the annual overhaul basis.

The principal work of the mechanical shops for "The Panama Canal" consisted of maintenance and repair jobs on equipment such as dredges, tugs, etc., though other work was done. In 1921 a cattle ship which had previously been a dredge, was reconverted for use as a sea-going dredge. During the next fiscal year five electric towing locomotives for the locks were completed, and during 1923 a sixth was completed and a seventh was put under way. In 1924 the program was heavier. Much floating equipment was rehabilitated, four electric locomotives were put into process of manufacture, and seventeen large rising-stem gate-valves were fabricated.

The dry docking of vessels was merely an accompaniment of, or preliminary to, repairs and replacements. The number of ships entering the dry docks was as follows:

	Balboa dock		Cristobal dock		Both docks		
Fiscal year	Canal equipment	Other equipment	Canal equipment	Other equipment	Canal equipment	Other equipment	Total
1920	21	59	18	50	39	109	148
1921	24	62	25	42	49	104	153
1922	50	43	23	65	73	108	181
1923	23	37	16	37	39	74	113
1924	27	42	25	43	52	85	137

"The Canal" performed car inspection and repair service for the Panama Railroad and operated the Balboa and Cristobal roundhouses, the retirement and storage of excess and obsolete equipment constituting part of the program. Construction of new equipment was also a feature of the work as well as the rebuilding of old. The work included the construction of three parlor cars in 1921, the rebuilding of four coaches and the refinishing of four more in 1922,[15] and the construction of one baggage and one hospital car, the reconstruction of one coach, and the building of two gasoline motor cars and a trailer in 1923. During the fiscal year 1924 work was restricted to inspection and repairs.

The drop in the work of the mechanical shops which was so sharp in 1921 continued in 1922. Work for "The Panama Canal" continued to decrease as construction tapered off, slides remained

[15] In this year also fifteen locomotives were sold, dismantled and prepared for shipment to the United States.

controllable, and equipment was retired. The condition existing in 1922 in comparison with previous years is mentioned in the annual report of the Governor for that year:[16]

For the month of June, 1922, the average total force working, not including employees on leave or furloughed, was 861, as compared with an average of 2621 for the fiscal year 1920-21 and of 2869 for 1919-20. The force now employed is much below what it should be for the economical operation of so extensive a plant, and if any large job were to be handled it would be necessary to send to the United States for additional men.

This report further discussed the probable future of the shops as follows:

Work for The Panama Canal will probably not increase in amount, and may even be less in future than in the past, but work for commercial shipping should gradually increase. However, the most that can be hoped for from commercial shipping is emergency work on vessels using the canal and possibly an occasional overhauling job on vessels that have either Balboa or Cristobal as a terminal port. In the latter case the mechanical division must be able to compete successfully with repair plants at the other end of the run. The majority of ships passing through the canal are laden and on a definite voyage and could not afford to stop here for extensive repairs even if the work cost materially less than elsewhere, as the running expenses of the ship would more than offset any possible saving on the repair bill.

Increased attention was given to costs, the reductions in volume having increased overhead charges from 45.26 per cent in 1921 to 54.43 per cent in 1922. From November 1921, also, the customer was given the option of having his work done either under the cost-plus system of charges as before or under a flat rate determined and collected in advance of undertaking the work. In practice the flat rate was confined, usually, to small or simple jobs.

By 1923 the overhead had increased to 56.50 per cent, but the actual amount of such charges had been reduced by $63,000 in spite of an increased cost for water and electricity amounting to $30,000. The shops, in this year, after transferring $50,000 to reserve, showed a net profit of $100,473.26, which with $41,032.44 deducted for fixed capital charges returned to surplus $59,440.82.

[16] Governor, Annual Report, 1922, p. 17.

During 1924, $65,000 was invested in new roofing, new machinery and tools were purchased, and worn out equipment was replaced by similar tools lying unused at other shops. Out of current earnings $105,000 was set aside for improvements and replacements and over $81,000 was added to reserves.[17] The net profit for the year was $171,737.06. While matters were improving, it was obvious that "The Canal" was over-equipped for the mechanical repairs it was performing.

Coal. Another of the business operations of "The Canal" was the transportation, storage, and distribution of coal. This activity was handled for "The Canal" by the Panama Railroad through its plants.

The volume of business classified according to patrons and by fiscal years follows:

TONS OF COAL SUPPLIED BY "THE PANAMA CANAL"

Purchaser	1920	1921	1922	1923	1924
Commercial vessels	479,488	424,680	228,231	198,906	202,316
Panama Railroad	24,519	9,622	4,519	9,630	3,707
Panama Canal	19,409	20,817	8,584	5,498	6,840
United States Army	10,960	8,418	6,343	7,120	6.830
United States Navy	18,739	[a]	[a]	[a]	[a]
Miscellaneous	5,034	5,278	3,939	3,310	3,041
Total	558,149	468,815	251,616	224,464	222,734

[a] During these years the Navy maintained its own supply, from which the following tonnage was delivered: 1921, 76,129; 1922, 38,044; 1923, 34,154; 1924, 34,799.

The steady decrease in coal sales resulted from numerous causes. Until the early part of the year 1921, for instance, coal costs at Panama were lower than at competing stations, but about that time the situation changed. The pertinent question of the cheapness of coaling and the increase of oil as a fuel was touched upon briefly by the Governor of "The Canal" as follows:

Norfolk, at which vessels may call en route between Europe and Panama, is one of the cheapest coaling ports in the world. The distance between bunkering stations is, of course, a further factor. Coal costs along the east coast of South America are heavy, but there is additional trade to be had there, especially in passenger traffic; in the future, the development of oil fields of Pata-

[17] The reserve for repairs, however, showed a deficit of $3,646.89.

gonia may insure cheap fuel in that area. The increasing use of oil fuel in steamships and of motorships will reduce the inequalities in bunkering costs over the world, besides making it possible for many ships to bunker at a cheap station for the round voyage. Lloyd's Register for 1921 shows only 20.6 per cent of ocean-going vessels using oil fuel, but of 4160 transits of the canal or calls by ships at Panama Canal ports in 1921, oil was supplied in 1175 instances. This indicates a larger proportion of oil-burning ships to the total in the canal trade than is shown by Lloyd's for the total of world shipping.[18]

The drop in sales in 1921 was attributed to the general shipping depression. Labor forces were reduced, three eight-hours shifts were cut to two, and improvements in service were instituted by means of changes in and additions to mechanical handling devices. These tended to reduce costs and speed up service, but sales continued to fall.

The fiscal year 1922 showed a loss on the year's business of approximately $425,000, due partly to the reduction in volume of sales and the consequent increased overhead cost per ton for handling, and partly to price fluctuations which necessitated the sale of much tonnage at an actual loss in order to move it at all.

The decline in sales in 1923 was not so marked, though still considerable. The tendency continued partly because of the increased use of oil and partly because the price of coal at Panama remained higher than at other ports at which ships using the canal might bunker.[19]

As a matter of economy the Balboa coaling plant was shut down on March 31, 1923, but in spite of this and other measures looking toward a reduction of expenses the year's operations showed a loss of over $12,000.[20]

In 1924 efforts were made to stimulate coal sales, the result being a reduction in the rate of decrease, though an actual decrease of nearly 7000 tons still maintained. Due to economies of operation, however, the plants showed a profit of $161,500 for the year.

[18] Governor, Annual Report, 1921, p. 4.

[19] As of August 16, 1922, special prices for coal taken in large quantities were abolished and a flat rate substituted.

[20] Governor, Annual Report, 1923, p. 20.

On the question of coal consumption the annual report again speaks:

Apart from questions of price, the use of oil for fuel on a scale that was not anticipated 12 years ago, when the coaling plants were designed, is responsible for the small volume of business. Of the steam vessels which passed through the canal during the fiscal year 1924 approximately 70 per cent burned oil. The proportion of motor vessels is not yet large, but to the extent of their use they also reduce the demand for coal.[21]

The economies resulting from a careful study of the coal handling problem at "The Canal" enabled the organization to put into effect marked reductions in price during the latter part of the fiscal year 1924,[22] but new business was not attracted in the volume anticipated.[23]

The same problem faced the coal handling organization that confronted the mechanical shops, but to a greater extent; namely, excessive plant and equipment for the volume of business conducted.

Liquid Fuel. The liquid fuel business of "The Panama Canal" included the storage, direct sale, and pumping of fuel oil, Diesel oil, and gasoline, the greatest proportion of the business by volume being in fuel oil. So too, the pumping of oil, rather than direct sales, produced the great bulk of the revenue.

The figures for liquid fuel sales by "The Panama Canal" and private companies follow:

FUEL OIL, DIESEL OIL AND GASOLINE SOLD

Fiscal year	Fuel oil (bbls.) sold by		Diesel oil (bbls.) sold by		Gasoline (gal.) sold by
	Panama Canal	Private companies	Panama Canal	Private companies	Panama Canal
1920.....	664,075	3,659,293	....	.....	.....
1921.....	292,343	1,824,259	1,719	132,090	43,185
1922.....	13,309	2,489,216	581	69,489	36,772
1923.....	.....	4,545,235	2,421	54,862	20,335
1924.....	4,043	6,128,619	3,550	129,617	.....

[21] *Ibid.*, 1924, p. 23.

[22] The policy continued to be that of fixing the minimum figure that would cover all charges including amortization, interest and maintenance and a profit of from 4 to 8 per cent.

[23] Average monthly sales were increased from 16,566 tons during the first half of the year to 21,716 tons in the second half.

Direct sales of fuel oil by "The Panama Canal" dropped off to a negligible quantity, while private sales, excepting always the slump year 1922, show a steady and heavy increase. This involved increased revenue for "The Canal," since it did the oil pumping. Diesel oil sales by "The Canal" showed a steady, though small increase, again excepting the one year, while the sales of private companies fluctuated widely. Gasoline sales dropped off to nothing.

The liquid fuel business of "The Canal" showed varying profits through the years as follows:

REVENUES, EXPENSES, AND PROFIT ON HANDLING AND SALES OF LIQUID FUEL

	1920	1921	1922	1923	1924
Handling Fuel Oil:					
Revenue	$146,449.32	$184,209.56	$254,019.80	$468,867.15	$556,376.95
Expenses	77,456.35	143,981.10	189,038.46	256,159.19	305,454.28
Profit	68,992.97	40,228.46	64,981.34	212,707.96	250,922.67
Fuel Oil Sales:					
Revenue	1,228,133.66	892,715.87	186,488.64	473,315.90	507,497.60
Expenses	1,006,393.61	373,839.61	223,481.07	431,128.72	503,352.68
Profit	221,740.05	518,876.26	[a]36,992.43	42,187.18	4,144.92
Tank Rentals:					
Revenue	.....	.....	24,319.54	12,268.44	8,126.66
Expenses	.....	.....	17,426.27	20.42	.....
Profit	.....	.....	6,893.27	12,248.02	8,126.66
Total:					
Revenue	$1,374,582.98	$1,076,925.43	$464,827.98	$954,451.49	$1,072,001.21
Expenses	1,083,849.96	517,820.71	429,945.80	687,308.33	808,806.96
Profit	290,733.02	559,104.72	34,882.18	267,143.16	263,194.25

[a] Loss.

Oil sales resulted in a considerable loss in 1922, due to the necessity of reducing inventory and selling on a falling market. The pumping and handling of oil for private companies, however, made up the loss and added a profit, as the table shows. The oil handling continued to be the main activity of the liquid fuel field, accounting almost wholly for the profits made in later years.

General Ship Supplies. The three storehouses at Cristobal, Paraiso, and Balboa continued to act as agencies through which supplies (ship chandlery, etc.) were issued to "The Canal," the railroad, the Army and Navy, other government departments, and private individuals and companies. In addition the storehouses continued to dispose of scrap and obsolete equipment and to care for unused equipment relegated to storage.

The general activity of this phase of the business operations, as indicated by value of materials issued, is shown by the accompanying figures:

1920.....	$11,966,308.81	1922.....	$7,422,807.49
1921.....	10,790,198.46	1923.....	6,034,647.81
	1924.....	$5,468,971.97	

In each fiscal year the sales to "The Canal" and to the Panama Railroad accounted for over 80 per cent of the total.

Here as with certain other branches of "The Canal's" business operations, the volume of work dropped off steadily, and in general such reductions were not confined to any one type of sale or issue. In 1921 and 1922 efforts were made to reduce inventory and to issue the slow-moving items to prevent the tie-up of capital. The main stock was concentrated at Balboa, a smaller store house being maintained at Cristobal for economy and convenience and another at Paraiso primarily for dredging supplies. In line with the general business depression, outside business fell off about 25 per cent in 1922, and in spite of the general revival in the following years continued to decline.

The sales of scrap and obsolete materials during these years were as follows:

1920.....	$27,709.47[21]	1922.....	$177,627.98
1921.....	36,474.16	1923.....	448,888.14
	1924.....	$267,668.14	

Harbor Terminals. The work of loading, discharging, and interchanging cargoes between vessels at the Atlantic and Pacific terminals was continued as in the past. Financial statistics with regard to this activity follow:

CARGO HANDLING AT PIERS

	1920	1921	1922	1923	1924
Gross operating revenue.	$1,878,518.95	$1,505,810.95	$1,156,566 43	$1,101,908.01	$1,161,839.34
Gross operating expenses.	1,741,800.76	1,528,689.51	883,384.65	823,329.87	867,749.46
Net operating revenue...	$136,718.19	[a] $22,878.56	$273,181.78	$278,578.14	$294,089.88

[a] Loss.

The net revenue, with the exception of the year 1921, has shown a gratifying increase year by year, and this in spite of a steadily

[21] Only those sales items included, the original cost of which was more than $500.

falling gross operating revenue except in 1924. Obviously the reduction in expense of operating has made this showing possible. The saving on expense of handling is particularly emphasized when the tonnage for each year is compared with net revenue, which has risen steadily, despite fluctuations in the former. The number of ships and the tonnage involved is as follows:

	1920	1921	1922	1923	1924
Number of ships involved.....	1,421	1,368	1,618	1,912	2,205
Tons cargo stevedored.....	663,295	442,756	313,702	307,975	334,242
Tons cargo handled etc.....	1,480,436	1,109,726	830,134	837,271	933,092

Commissary System. The commissary system has involved numerous activities which have been operated with funds of the Panama Railroad, subject to the supervision of the Chief Quartermaster of "The Panama Canal." The variety of interests included purchasing agencies, manufacturing plants, wholesale departments, retail stores, refrigerating plants, and an industrial laboratory. The plan of operation was that of a self-supporting organization, being subsidized in no way in any of its branches. The stock in general, meats being the outstanding exception, have been purchased in the United States.

The volume of purchases was:

1920.....	$10,190,983.14	1922.....	$4,483,899.66
1921.....	8,096,039.35	1923.....	4,427,380.09
	1924.....	$5,159,529.67	

The reduction in inventory because of business depression in 1922 is clearly indicated by the figures for that and the succeeding year.

The sales during this period show the complementary side of the commissary activities.

Gross Revenues from Sales, by Purchasers

Purchaser	1920	1921	1922	1923	1924
Employees	$6,883,513.80	$6,414,813.91	$4,000,950.83	$3,797,343.97	$4,419,007.40
United States Government	2,161,118.46	1,736,682.50	1,219,544.76	1,083,820.98	1,001,572.10
Panama Canal	1,558,588.17	1,568,167.58	983,585.88	696,361.12	767,026.83
Steamships	1,119,852.93	949,380.29	359,789.69	343,598.17	468,291.68
Panama Railroad Company	411,480.95	348,485.58	215,697.09	170,399.89	230,285.10
Individuals and companies	272,866.75	313,845.66	323,417.21	[a] 601,649.42	598,549.69
Total	$12,407,421.06	$11,331,375.52	$7,102,985.46	$6,693,173.55	$7,484,732.80

[a] Increase due to leasing "The Panama Canal" restaurants to private interests, thus changing the classification.

The total profits of the commissary from August 1905, to June 30, 1921, amounted to $1,497,637.86, based on a total com-

missary valuation as of 1921 of $5,950,514.71.[25] The general operations in 1921 showed a loss of 3.6 per cent on the investment indicated. During 1922 the total business loss amounted to $241,992.35 on commissary activities, the loss on sales approximating that of the previous year, and amounting to 3.5 per cent. In 1923 a turn for the better occurred and a profit of $392,806.98 was shown,[26] although the total gross receipts were less. The reduction in this figure was due to decreased prices. The net profits mounted again in 1924 to $409,248.86 on increased gross sales and a capital investment approximately the same as 1923.

One of the most important divisions of the commissary work was the meat industry, although the peak of activity had been reached before 1920. In that year the Army canceled its order for 20,000 head of cattle and other reductions occurred. During this year forty-three round trips were made by "The Canal" cattle ships to Colombia, transporting livestock, principally cattle. Other cargo, passengers, and mail were carried, the year's operation showing a total net revenue of $40,726.29.

The sales of livestock and poultry during 1920 included the following: Cattle, 25,217, hogs 7598, goats 4, poultry 10,011.

Pasture lands had been cleared in the jungle, but these lands were frequent sources of trouble to the health department. Malarial areas were discovered, and it was found that in swampy lands the *Anopheles* mosquito frequently bred in the depressions left by the feet of the cattle. Areas of pasture land were thus condemned from time to time, in 1920, 5720 acres being so designated. Seeding and fencing of clearings was steadily carried on. In general, the policy was to fatten cattle during the rainy season and slaughter them during the dry months.

During a part of 1921 the importation of cattle from Colombia was discontinued, the cattle steamer "Caribbean" extending its service to include that previously furnished by Panama Railroad steamers touching at East Colombian ports. Business in 1921 fell off, as it did with other business enterprises. The production of

[25] Divided as follows: Commissary plants and stores $2,913,605.61; equipment $131,732.17; supplies on hand, $1,981,593.87; floating capital (approximately) $850,000; uncompleted improvements, $73,583.06.

[26] On a valuation of $3,517,134.57, made up as follows: Plants and stores $2,073,104.36; equipment $92,440.76; supplies on hand $851,589.45; floating capital $500,000.

beef formed a good index of the activity in the meat industry on the Isthmus, and this from 1916 had been:

Year	Number of head	Dressed weight
1916	7,762	3,843,377
1917	13,180	7,118,803
1918	21,731	10,778,446
1919	31,209	15,974,950
1920	23,199	11,335,120
1921	13,659	5,499,682
1922	7,662	4,476,038
1923	4,874	2,680,051
1924	6,442	3,415,254

The effect of Army orders during the war is clearly shown.

In the latter part of 1921 the cattle ship, which had for a time discontinued voyages, resumed cattle carrying, but after January 1922, no beef cattle were imported.

The loss on the entire meat industry for the fiscal year 1920 was $189,973.09, but in the following year a profit of $5032.82 was recorded. In 1922 the net operating revenue amounted to $143,103.55, but due to the necessity of writing off a considerable amount ($502,528.64) to loss on cattle on hand because of a drop in prices, a net loss of $359,425.09 was set down. For the fiscal year 1923 a net profit of $513.20 was made, and in 1924 this figure mounted to $25,437.39.

During 1920 eight plantations were operated, most of which were let to individuals on contract. All varieties of fruits and vegetables, both tropical and of other types, were grown. By 1921 there were nine such plantations, supplying over one million pounds of fruit and vegetables in addition to a similar amount supplied by Chinese farmers operating gardens under contract with the commissary. By 1922 but two plantations were directly operated, the rest being let out on the rental plan. The poultry farm, however, was abandoned by the contractor. During 1923 the nine plantations were continued, a loss of approximately $3000 resulting from operations, which figure was reduced to approximately $2500 in 1924. The dairy farm continued to operate at a small profit, but in general, the commissary activities were not profitable.[27]

[27] The poultry farm, as has been noted, was unsuccessful, and the tailor shops which had been operated were closed.

Hotels and Restaurants. Closely connected with the commissary system was the operation of hotels and restaurants in the Canal Zone. The two principal hotels, the Washington operated at Colon with Panama Railroad funds and the Tivoli at Ancon, were maintained largely for the convenience of visitors to the canal. In addition, in 1921, there were restaurants for American employees at ten different places and messes for laborers at three places. During this year the laborers' messes were changed to the cafeteria plan of service, the patrons having shown a unanimous preference for this system. Also

> The Hotel Aspinwall, which is the old French sanitarium, at Taboga, was operated during the year with the idea that employees would benefit by occasional trips to the island for themselves and families. Inasmuch as it was run at a loss it has been discontinued.[28]

Up until this period no interest charges on capital outlay had been made in connection with hotels and restaurants, but on January 1, 1922, a new accounting system was introduced which placed the employees' restaurants wholly upon a self-supporting basis. This showed such increased operating cost that the restaurants were leased to a contractor on May 1, 1922. The Washington and Tivoli were also advertised for lease, but the bids were rejected. In the fiscal year 1923 these hotels were operated at a loss of $17,938.72, while in 1924 the loss amounted to $25,487.35. The restaurants remained under private contract, but the hotels were continued under Government management in spite of losses because

> While these hotels are not profitable, their continued operation is considered necessary for the accommodation of visiting officials of the United States Government, tourists, travelers awaiting steamship connections, and strangers having business with The Panama Canal.[29]

Building and Other Construction Work. The building and other construction work here included under the general discussion of business operations refers only to activities undertaken for organizations other than "The Panama Canal" or the Pan-

[28] Governor, Annual Report, 1921, p. 33.
[29] *Ibid.*, 1924, p. 28.

ama Railroad. Such work was conducted on the "cost-plus" basis except for the Army and Navy, for which organizations the work was done at cost.

During 1920 work was started on a community house for the National Catholic War Council at Balboa and on the construction of an office building and quarters for the Royal Mail Steam Packet Co., at Cristobal. During this year also, offices and quarters were begun for the Central and South America Cable Company at Balboa. These three projects were completed during the fiscal year 1921, in addition to certain barracks and quarters for the Army. Numerous minor structures were finished and a considerable program of grading and filling and the installation of water, sewer, and drainage systems was carried out.

The building activities were subsequently reduced to a minimum by the practical completion of all the auxiliary works and enterprises, including Army posts, naval works, and the various private business establishments.

Printing. The Panama Canal Press operated during the postwar years with a varying volume of work, carrying in stock or manufacturing the stationery required by "Canal" operations and printing commissary coupon books, the Panama Canal Record, pamphlets, folders, and miscellaneous job items.

The plant was operated on a self-sustaining basis, and the experience over a period of years, ignoring fixed capital charges, was as follows:

Fiscal year	Revenue	Expenses	Profit
1920	$54,940.85	$55,336.26	[a]$395.41
1921	63,100.94	62,172.72	928.22
1922	70,978.07	73,627.79	[a]2,649.72
1923	157,255.18	158,229.05	[a]973.87
1924	260,838.01	256,464.96	4,373.05

[a] Loss.

The Panama Railroad. The experience of the Panama Railroad during the years 1920-24 is indicative of what may be considered normal operation. Traffic and financial statistics are, therefore, illustrative of what was to be expected with the canal in full operation.

There has been a steady reduction both in tons of freight and in number of passengers carried, and the financial table reveals a

Tons of Freight Carried

Type of freight	1920	1921	1922	1923	1924
Through commercial freight	42,567	41,529	42,033	38,596	47,633
Local commercial freight	90,080	64,531	56,127	54,803	49,930
Local Army and Navy freight	29,761	34,720	19,642	27,558	17,704
Local Panama Canal freight	307,692	134,942	53,248	60,785	58,131
Local Commissary freight	31,218	40,514	34,735	31,832	32,824
Company freight	42,926	4,795	2,230	1,995	2,782
Total	544,244	321,031	208,015	215,569	209,004

Number of Passengers Carried

1920	1,407,250	1922	736,965	1924	418,373
1921	1,244,835	1923	419,452		

General Financial Statistics

	1920	1921	1922	1923	1924
Average miles operated	55.30	51.45	47.61	47.61	47.61
Gross operating revenue	$2,284,745.78	$2,242,021.69	$1,552,400.54	$1,375,777.72	$1,418,652.48
Operating expenses	2,263,877.01	2,398,734.92	1,386,768.29	1,214,894.31	1,341,954.31
Net operating revenue	20,868.77	[a]156,713.28	165,632.25	169,833.41	76,698.17
Per cent of expenses to revenue	99.04	106.99	89.33	88.31	94.59
Gross revenue per mile of road	41,315.65	43,576.71	32,606.60	28,896.82	29,797.36
Operating expenses per mile of road	40,938.28	46,622.64	29,106.64	25,517.63	28,185.39
Net revenue per mile of road	377.37	[a]3,045.93	3,499.96	3,379.19	1,610.97
Revenue per passenger train mile	4.58	4.84	5.07	4.26	4.32
Revenue per freight train mile	8.22	10.03	8.82	10.25	10.43
Total revenue train mileage	299,195 mi.	260,468 mi.	192,112 mi.	175,517 mi.	174,694 mi.
Railroad revenue per train mile	7.64	8.61	8.08	7.84	8.12
R. R. operating expenses per revenue train mi.	7.57	9.21	7.22	6.92	7.68
Net revenue per revenue train mi.	.07	[a].60	.86	.92	.44

[a] Loss.

particularly unfavorable situation in the fiscal year 1921. However, at that time a change of policy was instituted. The railroad which in 1914 had ceased to be a through carrier, and thus a competitor of "The Canal" resumed the transportation of through freight across the Isthmus on June 10, 1921. This resumption came at the end of a fiscal year showing the smallest volume of business in fifteen years, due partly to the general depression of trade and partly to the completion of certain work on the Isthmus which had required extra trains. With regard to the resumption of the transshipment business an annual report says:

> The policy of refusing to transship cargo from terminal to terminal, except in unusual cases, was based on the desire to divert all traffic possible to the canal. It has been found in several cases, however, that this exposed cargo to considerable delay, because of the unwillingness of vessels transiting the canal to lift this cargo for the transfer only. The object of reentering the cocarrier business is not to increase the freight traffic on the railroad but to facilitate the transfer of cargo at the Isthmus.[80]

The result of this policy in increased tonnage was slight, however, since through commercial freight in 1922 increased but 500 tons over 1921 and in 1925 decreased some 3000 tons as compared with 1921. Although 1924 saw a sharp rise of 9000 tons, it could hardly be credited to the transshipment policy.

Certain construction work is to be recorded for the railroad during the year 1921. The pontoon bridge across the canal at Paraiso, which was opened for traffic in 1914, was declared unsafe and placed out of commission, while a new station was erected at Fort Davis. Other construction work involved the removal of a street bridge in Panama City and the completion of the railroad stables at Colon. This completed the post-war construction work, however, as the steady fall of traffic called for retrenchment.

In 1922 four railroad stations were closed on account of lack of business or reduction of force, including those at Mount Hope, Frijoles, Summit, and the new station at Fort Davis, which had just been completed in the previous year at a cost of over $30,000.

The Panama Railroad Steamship Line. The Panama Railroad Steamship Line was continued in operation as one of the business enterprises of "The Canal," though the financial showing was continuously unfavorable. The traffic experience was as follows:

[80] *Ibid.*, 1921, p. 35.

Freight Tonnage Transported

Panama R. R. ships:	Ships	Tonnage	Ships	Tonnage	Ships	Tonnage	Ships	Tonnage	Ships	Tonnage
Arrived	56	171,691	63	154,241	58	102,921	23	54,261	28	57,410
Sailed	54	136,356	59	160,636	59	94,178	23	52,069	27	56,762
Chartered ships:										
Arrived	37	200,410	17	82,107	32	32,922	31	60,724	31	63,990
Sailed	23	125,799	6	18,175	31	22,845	25	63,862	24	78,233
Total	170	634,256	145	415,159	[a]180	252,866	102	230,916	110	256,395
Total freight revenue		$5,242,679.57		$4,051,438.34		$2,029,661.96		$1,652,625.32		$1,649,687.72
Average rate per ton		8.26		9.76		8.03		7.16		6.43

Passengers Carried

Panama R. R. ships:	Ships	Passengers	Ships	Passengers	Ships	Passengers	Ships	Passengers	Ships	Passengers
Arrived	56	5,539	63	4,294	52	3,619	23	1,938	28	2,490
Sailed	54	5,003	59	4,420	56	2,888	21	827	25	1,030
Chartered ships:										
Arrived	19	432	19	1,035	39	2,751	32	3,600	24	3,098
Sailed	19	535	11	999	25	1,222	27	3,261	24	2,953
Total	148	11,509	152	10,748	[a]172	10,480	103	9,626	101	9,571
Total passenger revenue		$452,176.60		$522,837.99		$407,246.28		$379,423.30		$369,954.64
Average rate per ton		39.28		48.65		38.86		39.42		38.65

[a] Include 33 departures and 32 arrivals at Cristobal of vessels engaged in feeder service between that port and east coast ports of Colombia.

The financial experience of the steamship lines has been as follows:

Fiscal year	Expenses	Revenues	Deficit
1920	$6,839,078.76	$6,560,577.06	$278,521.70
1921	5,857,257.06	5,156,446.84	700,810.22
1922	3,450,231.02	2,862,898.57	587,332.45
1923	2,542,488.41	2,378,026.96	164,461.45
1924	2,749,433.78	2,443,576.29	305,857.49

In viewing these results of operation it is to be borne in mind that the line was operated as an adjunct of "The Panama Canal," and as such carried all freight and passengers for the United States Government at materially less than commercial rates.

Numerous other factors also entered into the production of the annual deficits. In 1921 a strike of marine engineers closed the line for one month, while tonnage fell off one-third. There was a general trade depression which continued during the next year, when tonnage again fell off 39 per cent. Moreover, competition in this year caused a marked lowering of rates between New York and South Pacific and Caribbean-Colombian ports. In 1922 numerous operating economies were instrumental in reducing the deficit as compared with the previous year, although a counter effect was introduced by the writing off of depreciation and deferred charges for general and extraordinary repairs incurred in previous years. In 1923 the decrease in tonnage, though continuing, was reduced to 9 per cent, while the factors previously mentioned as contributing to the deficit were still operative; but in 1924 a slight increase in tonnage was shown, namely, 11 per cent. In spite of this, however, due to increased expenses a deficit of $141,396.04 over the preceding year resulted.

Telephones. The telephone system was owned by the Panama Railroad Company but operated by the Electrical Division of "The Canal" as one of the business enterprises. The number of telephones in use on June 30 was:

1920 3330	1922 2448
1921 2992	1923 2554
1924 2748	

In 1921 an automatic exchange was installed at Gamboa, this in 1922 being supplemented by two more, making a total of twenty-nine exchanges. By 1923 the manual exchanges at Cristobal, Gatun,

and Pedro Miguel had so deteriorated that specifications and plans for new automatic equipment were prepared.[31] It was planned also to erect new buildings at the points mentioned.

The financial experience of "The Canal" with telephone, telegraph, and signal business during the past few years has been:

Fiscal year	Revenues	Expenses	Operating profit
1921	$193,920.80	$199,860.54	[a]$5,939.74
1922	203,216.02	201,422.88	1,793.14
1923	191,557.98	182,701.07	8,856.91
1924	208,972.97	207,145.98	1,826.99

[a] Loss.

Rentals, Land and Buildings. The Panama Railroad Company continued the practice of leasing lands and buildings to tenants. The types of agreement entered into were as varied as the uses of the property. The leases and licenses for use in the cities of Panama and Colon covered a wide range, from private residences to warehouses. Revocable licenses for land and buildings in the Canal Zone were also issued by "The Panama Canal" to steamship companies, oil companies, and other business concerns, the interests of which were connected with the operation of "The Canal." These structures included office buildings, oil tanks, and the like. Similar licenses were issued to permit public welfare organizations to erect churches,[32] lodge halls, and clubhouses.

Special agricultural licenses were granted under the circular which opened the Canal Zone to agriculture in December 1921. Under this plan lessees holding less than five hectares of land for use in crop raising paid no rental until July 1, 1924. For holdings above five hectares a rental of $5 per hectare per annum was charged, with a maximum permissible holding of fifty hectares by any one person. Most of such land was planted in bananas. Licensing of new areas was discontinued in 1925 with certain exceptions.

The railroad lands in the cities of Panama and Colon and the public lands in the Canal Zone were administered by a joint land office. Rentals for quarters occupied by employees were collected through pay-roll deductions.

[31] Balboa Heights exchange was also to be changed from manual to automatic operation.

[32] No rentals were collected for lots occupied by churches.

The financial results from real estate operations after the war were as follows:

Fiscal year	Gross revenue	Expenses	Net revenue
1921	$140,337.86	$25,287.75	$115,050.11
1922	143,449.40	34,499.39	108,950.01
1923	152,604.46	60,415.45	92,189.01
1924	157,095.27	67,738.43	89,356.84

In March 1922, the capital investment in railroad real estate was raised from $2,162,354.95 to $6,749,735.75, the increase being predicated on numerous improvements in Colon and Panama lands. At the same time the value of the capital assets represented by buildings constructed during the period of high prices for material and labor was reduced to the estimated cost of replacement under normal conditions, and the value of other units which had outlived their usefulness was removed from the capital account. The net reduction in railroad capital assets amounted to $2,113, 428.04, the principal items consisting of assets to the value of $1,892,316.33 returned to "The Panama Canal" and $206,943.31 charged to accrued depreciation. The following list, from the annual report of the Governor for 1922 (p. 25), covers the principal items that were reduced in value or removed, and their value written off to the increase in real estate:

Railroads and appurtenances	$1,892,844.67
Docks, piers, and appurtenances	347,430.46
Harbor terminal equipment	142,737.28
Coal plants	140,805.31
Farm industries	600,239.75
Commissary plants and stores	820,982.19
Buildings and other structures	108,827.24
Railroad equipment	71,397.90
Concrete dock, Balboa	373,742.10
Cristobal roundhouse	42,500.00

In 1923 "The Panama Canal" collected from employees $554,657.14 in rent for quarters, the expenses in maintaining quarters amounting to $512,451.46, while in 1924 the corresponding figures were $616,050.86 and $603,003.45.[33]

Clubhouses. The post-war years saw the continuation of the clubhouses in the Canal Zone, as an integral part of the system of

[33] This included a loss on operation of quarters for silver employees.

maintaining the morale of the personnel. An annual report of the Governor succinctly outlines the necessity for these clubhouses:

> The clubhouses serve well as stabilizers of what would otherwise be a constantly shifting, unanchored population, drifting inevitably to the demoralizing influences of the inferior cabarets and saloons of Panama and Colon, or leaving the service. The United States Government has created here a unique community of workers with no responsibility of citizenship as to government, no ownership of real and but little personal property, and no encouragement (in fact, no possibility in the Canal Zone) to private enterprise of any kind. The money appropriated by Congress for the clubhouses is a necessary corollary to the living conditions resulting in the Canal Zone from our policies.[84]

These clubhouses were operated so as to pay for their operation and maintenance, but no charge was made for capital costs. Light lunches, tobacco, soft drinks, confections, and novelties were sold and charges were made for special services, such as the use of bowling alleys and billiard tables. The net profits from operations, omitting capital charges, were:

1920.....	*$15,197.14	1922.....	$37,304.32
1921.....	14,393.13	1923.....	47,050.87
	1924.....	$5,098.90	

* Loss.

Until the fiscal year 1924 "The Panama Canal" subsidized the clubhouses to the extent of $150,000 per annum, but this was reduced at that time to $100,000, the accumulated surplus having reached the sum of $166,670.33. In this year, also, the clubhouse at Ancon was destroyed by fire but was replaced by a building formerly used for other purposes.

Summary. The preceding pages have reviewed more or less briefly the business activities of "The Panama Canal" during the post-war years and the varied showings they have made financially. It is obvious that certain hopes which had been entertained were not realized; that changed conditions markedly altered the possibilities in numerous fields of "Canal" activity. The results of the business operations as a whole, excluding the deductions which

[84] Governor, Annual Report, 1921, p. 73.

would have to be made on the basis of a three per cent per annum fixed charge on capital investment,[35] were as follows:

Fiscal year	Revenues	Expenses	Net revenue
1914	$690,298.32	$695,720.71	[a]$5,422.39
1915	2,135,074.92	2,191,475.70	[a]56,400.78
1916	6,488,521.61	6,476,623.17	11,898.44
1917	7,579,588.44	7,540,160.78	39,427.66
1918	10,324,071.91	10,317,912.35	6,159.56
1919	13,684,881.18	13,623,853.92	61,027.26
1920	14,705,371.82	14,465,685.69	239,686.13
1921	15,232,317.08	14,668,105.88	564,211.20
Total	$70,840,125.28	$69,979,538.20	$860,587.08
Profit previously carried in canal transit operations	.....	379,862.13	[a]379,862.13
Net	$70,840,125.28	$70,359,400.33	$480,724.95
Interest on public works, Panama, Colon, etc., not included in net revenues in prior years	619,584.59	.....	619,584.59
Adjustment status, June 30, 1921	$71,459,709.87	$70,359,400.33	$1,100,309.54
1922	7,747,227.57	7,423,968.41	323,259.16
1923	10,872,843.36	9,732,200.86	1,140,642.50
1924	12,968,777.29	12,067,153.17	901,624.12
Total	$103,048,588.09	$99,582,722.77	$3,465,835.32

[a] Deficit.

There were other income-producing activities of "The Canal," not directly connected with the transit of ships, which might thus have been considered under the head of "business operations," such as the municipal water supply, but they lie so much closer to the conduct of local government that they have been reserved for consideration under that heading.

Government. The third major division of "Panama Canal" work, including the activities of "The Canal" properly listed under the title of "government," continued after the war in practically the same fashion as before. Wherever possible it had been the practice to combine with, or assign to, existing canal-operating organization units, those functions of government easily assimi-

[35] The value of the business fixed property of "The Canal" was set down as follows: 1922, $26,935,776.70; 1923, $25,820,780.09; 1924, $25,370,852.06.

Population of Canal Zone by Classes

Census taken in June	Employees					Non-employees							Grand total
	American		Other			American			Other				
	Men	Women	Men	Women	Total	Men	Women	Children	Men	Women	Children	Total	
1920	3434	369	5652	74	9529	138	2037	2536	786	2662	3962	12,121	[a]21,650
1921	2599	323	5102	66	8090	226	2349	2661	1167	3487	5777	15,667	[b]23,757
1922	1849	269	4595	78	6791	214	2090	2481	1382	3805	6908	16,880	[c]23,671
1923	1873	315	4564	218	6970	282	2139	2518	1641	3931	7487	17,998	[d]24,968
1924	2037	327	4160	115	6639	331	2309	2801	2462	4334	8267	20,504	[e]27,143
1925	2087	353	4375	46	6861	229	2311	3010	2505	4327	8449	20,831	[f]27,692

[a] Includes 63 American civilian employees of Army and Navy and 151 prisoners.
[b] Includes 256 civilian employees of Army and 174 prisoners.
[c] Includes 226 civilian employees of Army and Navy and 170 prisoners. In addition to the total there was a military population as of June, 1922 of 8348.
[d] Includes 432 civilian employees of Army and Navy and 175 prisoners. Military population in addition 9797.
[e] Includes 142 civilian employees of Army and Navy and 127 prisoners. Military population in addition 10,054.
[f] Includes 91 civilian employees of Army and Navy and 116 prisoners.

lable. Thus, aids to navigation, steamboat-inspection, and hydrographic and meteorological work, which usually are assumed to be governmental activities, were assigned to canal operation. In many cases, also, employees performed duties concerned both with government and canal operation, while the costs of government were practically merged with those of administration.

Governmental duties and costs varied somewhat in accordance with population. Population statistics are given on page 109.

Public Health. There was little change in the principles of public health work in the Canal Zone subsequent to the war. The jurisdiction of the health officer continued to extend over the cities of Panama and Colon, with authority comparable to that of a municipal health officer in the United States, while in the Canal Zone his department was directly charged with all health work. Quarantine work at canal ports, curative work in public dispensaries and hospitals and sanitation including anti-mosquito and anti-rodent work continued to comprise the general program. In the anti-mosquito work a large proportion of permanent concrete surface and subsoil tiled drains were installed in place of the temporary dirt ditches or oiling of pools and streams of previous years.

No case of yellow fever had originated on the Isthmus since 1905, and this disease no longer existed as a menace. In 1920 one case was admitted to quarantine from Nicaragua, but it was isolated and no other cases developed from it. Special efforts were being made in Yucatan, Ecuador, and Peru at this time to eliminate the disease in these countries, which gave promise of eliminating yellow fever from the Western Hemisphere.[36] The vigilant quarantine continued in 1921 as before, and constant attention was given to keeping down the *Aedes aegypti* mosquito. By 1922, however, the elimination of yellow fever on the west coast of South America made it possible to relax quarantine restrictions very considerably, and the opinion was expressed at this time that conditions in the Canal Zone were so improved that even if a case of yellow fever were introduced in its infectious stage it would practically be impossible for it to spread to other persons.[37]

[36] For a discussion of this campaign, see International Health Board, Annual Report, 1924.

[37] Governor, Annual Report, 1922, p. 31.

In 1923 an epidemic outbreak of yellow fever occurred in the interior of Colombia, but except for certain small restrictions necessitated by this local source of infection, no yellow fever quarantine was imposed. On the contrary those restrictions previously in effect against Nicaragua and San Salvador were modified so as greatly to reduce the delay and annoyance to travelers from those countries. By 1924 the yellow fever menace had been so far effaced as not even to be mentioned in the annual report of the Governor.

An influenza epidemic started in March 1920, and by the end of the fiscal year there had been reported 1293 cases and 133 deaths. The epidemic originated in Colon, apparently from the United States fleet in the bay, and spread over the entire Zone and into Panama City. It became so severe that schools, motion picture theatres, and other places of assembly were closed for a period of two weeks. A sharp rise occurred in June, due to a local epidemic in a cattle pasture camp, where eighty-two cases of influenza developed. Some twenty-nine cases were brought in on board ship also, but quarantine was instituted for three days and no new cases developed. The following years saw no recurrence of this disease, at least in sufficient degree to require comment.

Eleven cases of leprosy from the Canal Zone and the Republic of Panama were admitted to the leper asylum in 1920, ten in 1921, ten in 1922, seventeen in 1923 and eighteen in 1924. The matter was under control, however, and the cases (which were predominantly native and negro) were quickly isolated. In 1924 there were ninety-two cases in the leprosarium of which six were white.

Smallpox to the extent of twenty-eight cases was reported on the Isthmus in 1920 and systematic vaccination was continued in the cities of Panama and Colon. In addition a vaccinator was dis patched to interior towns in Panama, and as many non-immunes as could be reached were vaccinated. No deaths were reported from the disease, and, by June 1920, but two cases remained in the hospital. During the next year smallpox and alastrim in Cuba, Haiti, and Caribbean ports were menacing, but no infection from these sources was reported. Twenty-eight cases were found on the battleship "Mississippi" arriving at the canal, but the ship was quarantined and no cases arose in the Canal Zone from this source. In 1922 twenty-one cases of smallpox were reported, but

during succeeding years the incidence of this disease was so slight as not to require comment.

Typhus appeared in 1921 in Mexico and Bolivia, but as in previous years no case reached the canal ports, and as had been the case since 1905 no bubonic plague was reported on the Isthmus during 1920 or 1921. The latter disease, because of its prevalence in certain other ports of the world, continued to be an ever-present menace and one which required unrelaxed vigilance. On this matter an annual report spoke as follows:

> The danger lies in the infection of rats in the ports and the subsequent spread of the disease to jungle rats and other wild rodents. In this way an enzootic residual focus would be created, the eradication of which would be well-nigh impossible. In order to forestall any such contingency, all vessels in canal ports are required to breast off and otherwise rat guard, and ships from infected ports are fumigated for the destruction of rats and other vermin. In addition a circular is given to the master of each arriving vessel, urging upon him the necessity for maintaining anti-rodent precautions in all ports and advising the frequent fumigation of his vessel, no matter whether it has touched at known infected ports or not. The results of the periodic fumigation of ships have been most gratifying. Frequently vessels on their first fumigation are found to have harbored large numbers of rats, but on subsequent fumigations are found practically rodent free.[38]

During 1922 increased numbers of ships were fumigated, it being found that second and third fumigations revealed the presence of few rodents, regardless of how many had been present on the first fumigation. The possibility of rat elimination, therefore, was promising. Bubonic plague continued to threaten in 1923 from west coast South American ports, and the energetic fumigation of ships was continued. By this time it was felt that because of the comparatively small rat population and the existence of rat-proof piers and buildings no serious epidemic would result even if the disease should gain entry, but the effect on traffic and revenue would be considerable, since other nations would impose quarantine against the canal.

In spite of unrelaxed vigilance and vigorous measures malaria on the Isthmus continued its troublesome career after the war. The

[38] *Ibid.*, 1921, p. 43.

difficulty of eliminating this disease has been previously discussed, together with the effects which the opening of pasture lands and small farms to ex-employees of "The Canal" has had. Malaria cases varied as follows:

Class	1921	1922	1923	1924
Employees	325	176	216	208
Military and naval personnel	810	828	870	894
Non-employees	459	243	657	521
Total	1594	1247	1743	1623

The sharp rise in cases during 1923 had been predicted and with regard thereto the annual report of that year spoke pertinently as follows:

The increase in the number of cases of malaria among non-employees experienced this year was expected and predicted as a result of the new policy of allowing unemployed laborers to return to the zone to take up land for agricultural purposes. It is impracticable to sanitage completely the country in which these settlers live. They are widely scattered over the available parts of the zone, living in rude shacks near water courses and the lake, and are at all times exposed to malarial infection. About 1805 licenses have been granted these settlers and it is estimated that 650 families are now living on the land. Each home has a pit privy, not uncovered nor water tight, but at least limiting the chances of intestinal infection. Many have learned to boil their drinking water, and some are undertaking drainage. They have a certain amount of supervision by the American authorities, including the sanitation and police forces, and have, at least until they are able to pay for it, free medical service at The Panama Canal dispensaries and hospitals. No licenses are granted within a mile of Army posts and important residential sections of the zone, but unfortunately laborers residing in zone towns exchange visits with these settlers, and it is believed that many cases of malaria among the colored employees and their families have resulted from this practice.[39]

The diseases mentioned, except, of course, malaria, include those which have been most closely associated with the necessity of quarantine and port inspection, and with regard to such work considerable improvement in technique was developed after 1920. No better expression of the aims and methods of quarantine at the

[39] *Ibid.*, 1923, p. 29.

canal is to be found than in an annual report of the Governor. It is quoted at length:

The basic policy on which the quarantine of The Panama Canal has been operated . . . has been to facilitate to the utmost the movement of ships consistent with the safeguarding of the health of the Canal Zone and the personnel of arriving vessels. To this end the detention of passengers and ships has been reduced to the lowest margin of safety; vessels have been boarded from speed launches; passengers have been inspected while the ship was under way; the hours of boarding have been lengthened to 10 p. m., so that ships arriving after sundown would be ready to begin their transit of the canal at sunrise; shipmasters have been encouraged to have the passengers and crew mustered and ready for inspection as soon as the vessel arrived at the quarantine area; the number of places quarantined against has been reduced to those known to be infected with quarantinable disease; a system of granting pratique by wireless to naval ships has been instituted; and the principle has been followed that as a rule disease is carried by the living things aboard arriving craft rather than by the inanimate vessel itself. The extent to which this principle has been carried into practice is evidenced by the fact that at Cristobal during the year three ships were detained a total of three days, as against six ships for a total of seven days in the fiscal year 1920. At Balboa the results were even more striking, 19 ships being held a total of 66¼ days, as against 91 ships for 198 days in the previous fiscal year. These reductions in delays to commercial ships and passengers translate themselves into financial savings of considerable magnitude.

While there has been a marked reduction in the average length of delay to ships, there has been a coincident increase in the total operations. In spite of the falling off in shipping because of marine labor troubles, the quarantine officers at the terminal ports inspected 4153 vessels in the fiscal year just ended as against 3440 in the previous fiscal year, an increase of over 20 per cent. In the same period the total number of persons inspected on arrival increased from 324,263 in the fiscal year 1920 to 403,823 in the fiscal year ended June 30, 1921, an increase of 24.5 per cent.[40]

In 1922, in furtherance of economy, a consolidation of functions of the two quarantine stations was brought about. The station at Cristobal was reserved exclusively as a boarding and fumigation station, while that at Balboa was used as a boarding and detention station. As a result it was possible to close all detention quarters at Cristobal. Persons arriving at Cristobal, who were to be quaran-

[40] *Ibid.*, 1921, p. 42.

tined, were transported to Balboa by hospital car and ambulance. Vessels at Balboa, requiring fumigation, were either fumigated there by trained employees from Cristobal or taken through the canal to the latter port for fumigation.

A policy of coöperation with other nations in matters of quarantine was initiated and developed. In 1923 the chief quarantine officer visited the principal ports of Central America on both the Pacific and Caribbean coasts and the west coast of South America as far south as Valparaiso, this trip resulting, among other things, in a freer exchange of sanitary reports. During the next year still more encouraging results were obtained.

On the invitation of the President of the Republic of Panama a conference of quarantine authorities of the west coast of South America convened at Panama on February 25, 1924, and continued in session until February 29. It was attended by official delegates from Chile, Peru, Ecuador, Panama, and the United States, and accomplished useful results in the simplification and standardization of quarantine methods and the closer coöperation of quarantine authorities.[41]

The chief quarantine officer of "The Panama Canal" did much of the preparatory work for this conference and acted as secretary.

The remaining activities concerned with health were those more closely allied to the functions of a municipal health department, including the administration and operation of public hospitals and dispensaries [42] and such matters as infant mortality, tuberculosis, and venereal disease.

The measures taken with regard to venereal disease are well outlined in an annual report.

A free venereal disease clinic, where both curative and prophylactic treatments are given, was established at Santo Tomas Hospital in Panama on August 25, 1919, and one at Colon—maintained by the American National Red Cross—on March 1, 1920. An educational campaign has been pushed, pamphlets distributed in English and Spanish, and moving pictures dealing with this question shown. A notice, warning against all prostitutes, is handed by the quarantine officers to the crews of all incoming vessels. Meet-

[41] *Ibid.*, 1924, p. 34.

[42] On January 1, 1922, the medical storehouse was transferred from the jurisdiction of the Health Department to the general stores of the Supply Department.

ings with Panaman, Canal Zone, military officials, and representative citizens have been held at which the program of attack as carried out in the United States was approved as the program for the Isthmus. However, as yet conditions in Panama and Colon remain basically unchanged. The standard forms of laws for the repression of prostitution and control of venereal diseases, as compiled by the commission on training camp activities of the War and Navy Departments, were long ago submitted to the officials of the Panaman Government upon their request, but they have not seen fit to pass any laws modeled upon them. A number of alien prostitutes have been deported to their native countries but prostitutes are still numerous in the two terminal cities. The incidence of venereal disease is very high in this portion of the world, and the existing conditions are deplorably unsatisfactory. The health department is powerless to control the high incidence of venereal disease without the coöperation of Panaman authorities able and willing to pass and enforce proper laws for its control.[43]

The statistics relating only to those hospitals directly under "Panama Canal" administration were as follows:

In hospitals at beginning of fiscal year:	1920	1921	1922	1923	1924
White	301	285	296	253	290
Colored	750	652	591	558	564
Total	1,051	937	887	811	854
Admitted:					
White	6,287	6,341	4,764	4,345	4,454
Colored	6,799	6,173	4,496	4,286	4,973
Total	13,086	12,514	9,260	8,631	9,427
Died:					
White	106	88	71	65	77
Colored	400	303	260	242	230
Total	506	391	331	307	307
Discharged:					
White	5,812	5,925	4,466	3,981	4,189
Colored	5,808	5,191	3,729	3,547	4,260
Total	11,620	11,116	8,195	7,528	8,449
Transferred:					
White	385	319	270	262	184
Colored	689	738	540	491	404
Total	1,074	1,057	810	753	588

[43] Governor, Annual Report, 1920, p. 299.

Municipal Engineering. The work in municipal engineering continued unchanged and included such matters as necessary surveys for new townsite projects, the lay-out and design for water distribution systems, sanitary and storm drainage sewers, streets, sidewalks, and landscape gardening; also the maintenance and construction of roads and the maintenance and operation of water pumping stations, purification plants, pipe lines, and certain pertinent construction work.

Water supply constituted one of the chief activities of the Municipal Engineering Division. The methods adopted for insuring ample water supply have been discussed previously, these falling directly under " The Panama Canal " operations and the Section of Meteorology and Hydrography. Actual pumping and distribution, however, were under the jurisdiction of the Municipal Engineering Division.

The consumption of water has been as follows in gallons:

	1921	1922	1923	1924
Canal Zone	7,582,672,652	3,671,055,000	2,807,771,000	2,633,131,000
City of Panama	1,080,412,000	1,060,754,000	1,063,954,000	1,088,266,000
City of Colon	708,429,750	639,157,500	716,883,250	609,906,750
Sold to ships	165,688,188	121,062,293	111,583,750	126,238,500
Total	9,537,202,590	5,492,028,793	4,700,192,000	4,457,542,250

The financial experience of " The Canal " in the operation of the water system has been, in total, the following:

Fiscal year	Revenue	Expenses	Profit
1921	$459,205.18	$465,793.74	[a]$6,588.56
1922	475,039.22	470,790.45	4,248.77
1923	624,235.99	552,932.49	71,303.50
1924	573,209.76	530,045.32	43,164.44

[a] Loss.

No change was made during the years 1920-25 in the source of water supply, Brazos Brook Reservoir supplying Cristobal, Colon, and the Army and Navy posts east of Colon; Agua Clara Reservoir serving Gatun and Fort Sherman; and pumping from the Chagres River providing for the southern part of the Isthmus.

In 1921 the system comprised two reservoirs, ten pumping stations, three purification plants, over 130 miles of mains and about fifty-five miles of branch mains. During the next year a new pumping station was installed at Pedro Miguel to supply filtered

water to the west side of the canal in place of distilled water formerly used at that point for domestic purposes, while in 1923 a concrete surge tank was constructed at Summit, the high point on the water main between Gamboa pumping station and the Miraflores filtration plant. During April of this year a main running under the locks at Pedro Miguel developed a serious leak which could not be repaired without putting the locks out of commission for an impracticable period. Accordingly a new line was laid in a trench dredged in the bottom of the canal at Paraiso. A windmill was also erected to supply water to the village of Monte Lirio.

The year 1924 produced slides along the Panama Railroad north of Pedro Miguel, after heavy rains, which carried away part of a thirty-inch water main between Gamboa and Miraflores. During repairs water from Miraflores Lake was drawn out by a suction dredge and then pumped by a temporary station to Panama, Balboa, and Ancon.

During the same period of bad weather a portion of the Toro Point main was carried away by the surf and had to be relocated. The 12-inch line from the Agua Clara pumping station to the Gatun storage tank was also relocated and shortened. A new wash water tank was installed at the Agua Clara purification plant, and the steel wash water tank at Mount Hope was cleaned, repaired, and repainted. A 6-inch water line was extended along the Panama Railroad tracks in Gatun to provide fire protection for buildings in this vicinity. The construction of a new concrete water tank at Paraiso was started and 60 per cent completed at the end of the year.[44]

Considerable work of building construction was carried on also.

The work of sewage disposal and sewer maintenance and construction continued to be almost wholly a matter of routine. Sewers in the Canal Zone and terminals cities were flushed weekly, while in 1920 an intercepting sewer parallel to the water front at Panama was put under construction. During 1922 over 2200 feet of additional sewer line were constructed to care for excess surface water during periods of heavy rainfall, while in 1923 the only operation worth comment was the installation of three new sewage pumps. In 1924 a sewer line at Gatun, washed away by floods, was relocated and replaced and a new line was laid to care for employees' quarters at Pedro Miguel.

[44] Governor, Annual Report, 1924, p. 35.

The work on roads and highways continued to include not only the cleaning and maintenance of the surface, but also grass cutting on road borders and the clearing of ditches and drains. By 1922 resurfacing of many of the macadamized roads had become necessary, the automobile not only increasing surface wear but also adding to traffic so that sidewalks became necessary in Ancon and Colon.

During 1923 construction was undertaken as follows:

A concrete road 1760 feet in length and 18 feet wide was constructed from Silver Town, Mount Hope, to connect with the road leading from the cold-storage plant to the Margarita Road. This will serve to shorten the distance from Cristobal, Colon, and Mount Hope to France Field, the Naval Air Station, the submarine base, and Fort Randolph by 6600 feet, besides eliminating dangerous curves and grades and interference with the operation of the cold-storage plant.

Tivoli Avenue was resurfaced from the corner of Ancon Boulevard to the Tivoli Hotel, and a dangerous curve at the intersection of these two roads was widened.

The Paraiso-Gamboa macadam road was repaired, oiled, and sanded.

The ramp projecting into the street in front of the Cristobal commissary, which interfered greatly with the heavy traffic in that vicinity, was removed and replaced with a concrete pavement.

The asphalt surface of a number of roads in the southern district has worn very smooth, becoming dangerous to vehicular traffic in wet weather and on heavy grades. The surface of such roads was roughened.

Pedestrian and vehicular traffic has increased to such an extent in Ancon and Balboa that concrete sidewalks were constructed at four different points to eliminate the danger of accidents to pedestrians.[45]

Highway activities of a similar nature but in increased volume were carried on in 1924.

The previous practices with regard to garbage disposal were continued, incineration being used for garbage from the northern district and burying at dumps for the southern.

The water and sewage systems for the cities of Panama and Colon show widely differing experiences. In 1922 the revenue from water sales in Colon was sufficient to cover maintenance,

[45] *Ibid.*, 1923, p. 33.

interest, and repayment charges and return a surplus. In Panama, however, a deficit of $22,677.08 was experienced, which, added to the previous year's loss, made a total of $95,950.24. This necessitated the neglect of needed repairs and maintenance. In 1923 a deficit was incurred by both cities totalling $121,410.46, which was paid by the Republic of Panama. In spite of losses, however, it was necessary to expend $26,100.57 on the streets and sewers of Panama and Colon, these items being charged against the Republic of Panama. During the next fiscal year water revenues in Colon were sufficient to wipe out the deficit for that city as of the end of the previous fiscal year and to accumulate a surplus which was applied against capital cost. The city of Panama, however, again showed a deficit, which was added to that for which the Republic of Panama was already responsible.

Public Order. By the fiscal year 1920 the extra police activities forced upon "The Panama Canal" by the war had largely subsided and the normal course of police work was resumed, although at no time was it strictly comparable to that of a municipal police force in the United States. Confidential investigations with regard to matters affecting "The Canal" and the United States Government on the Isthmus were imposed upon the organization, and other activities departed widely from normal police routine because of the cosmopolitan nature of the floating population.

The actual work in "Canal" villages was of a simple routine nature, complications arising only at the ports. Some trouble was experienced with the opium or narcotic traffic on the Isthmus, but by 1921 this had been brought under control. Eight arrests under the opium and drug acts were made that year and six the next. In 1922 it was found possible to reduce the police force.

A continuous patrol of the harbors was maintained, largely for the enforcement of the navigation laws and for the prevention of smuggling and irregular ship traffic. A launch patrol was maintained on Gatun Lake and the Chagres River, details of police were continued at the locks, and motorcycle patrols remained on duty at Balboa and Cristobal.

The convicts "were employed on roads and municipal improvements, the maintenance of the penitentiary buildings and grounds, the manufacture and repair of prison clothing and the cultivation of the penitentiary farm, where convicts raise[d] a

large part of their own food."[46] The value of convict labor in penitentiary and jails was valued, at standard rates, as follows:

1921	$22,827.19	1923	$52,176.25
1922	30,848.62	1924	50,875.24

Fire Protection. The matter of fire protection in the Canal Zone involved no unusual problems and followed closely municipal practice in the United States. Periodical inspections of all fire hazards were made, and both paid and volunteer[47] fire departments were maintained. Automobile apparatus was installed as funds and obsolescence of equipment dictated, and in 1924 the two-platoon system was introduced at the request of the men.

The Courts. No fundamental or important changes in court organization or procedure occurred after the war or in fact subsequent to 1914. The courts continued to use the organization of "The Panama Canal" for administrative purposes, but in other respects they were not under the jurisdiction of the executive power on the Canal Zone. The judicial system continued to include the office of district attorney, the marshal, the district court, and the magistrate courts.

Public Schools. The public schools in the Canal Zone operated as in the past, with the white and colored pupils segregated. The changes in enrollment for the post-war period were as follows:

Fiscal year	Net enrollment			Teachers		
	White	Colored	Total	White	Colored	Total
1920	2004	1481	3485	74	24	98
1921	2082	1454	3536	85	24	109
1922	1897	1809	3706	77	32	109
1923	1766	2010	3776	75	39	114
1924	2094	1911	4005	80	39	119

By the fiscal year 1924 there were two high schools and six grade schools for white children in operation and seven grade schools for colored children.

Miscellaneous Functions. Other functions of government on the Isthmus showed but little change during the period subsequent to 1920, and none of moment.

The postal service operated as previously, carrying all official mail of "The Panama Canal," the Army, and the Navy within

[46] *Ibid.*, 1922, p. 35.
[47] In 1920 there were twenty-two of these, later reduced to seventeen.

the Canal Zone, free of charge, and paying transportation charges on official mail to the United States. The postal system continued to pay in accordance with the "Taft Agreement," a subsidy of 40 per cent of the face value of postage stamps and stamped paper furnished by the Republic of Panama. In 1922 Treasury savings certificates were offered for sale through the local post offices. Transit mail was handled as follows:

All United States and foreign closed transit mail destined to the west coast of Central and South America, as well as mail exchanged between Cuba, Jamaica, and other insular governments, with Colombia, Costa Rica, Venezuela, etc., is consigned to or handled under the supervision of the director of posts of the Canal Zone. Arrangements were being made at the close of the year to handle the transit mail of the Republic of Salvador.[48]

On July 1, 1924, the postal system of "The Panama Canal" was relieved of the subsidy on Republic of Panama stamps. "The Canal" thereupon had printed, in advance, for the fiscal year 1925, the estimated quantity of United States stamps (surcharged "Canal Zone") which would be used in that year, at an approximate cost of $1500. For the previous year under the subsidy, approximately the same number of stamps had cost over $33,000.

The customs work on the Canal Zone remained unchanged after 1920 both in principle and practice, the Bureau of Customs continuing to discharge the duties of Chinese exclusion in addition to its regular functions. A careful watch for smuggling was maintained as well as for violations of the opium act.

The duties of shipping commissioners continued as previously, and no change was made in the process of administering estates, while negotiations concerning general relations with the Republic of Panama were also carried on as before.

Administration. Matters of administration need little separate discussion for the years 1920 to date, since they have been necessarily included, to a large degree, in the recital of the activities of "The Panama Canal."

Organization. Certain changes in organization occurred, however, from time to time. In 1921 it was found that the increase of detailed duties pressing upon the Governor and the Engineer

[48] Governor, Annual Report, 1922, p. 39.

of Maintenance hampered them in executing more important work. As a consequence, on May 10, 1921, the office of Assistant Engineer of Maintenance was established, with supervision of a portion of the engineering duties centering in the office of the Engineer of Maintenance. The incumbent of this office also acted as representative of "The Canal" on the Wage and Complaints Board.

On June 1, 1921, as has been mentioned, the Building Division was abolished and the remaining force transferred to the Supply Department.

On July 2, 1921, a new Engineer of Maintenance was appointed[49] and given supervision over the following units: (1) Section of Surveys, (2) Division of Lock Operation, (3) Office Engineer, (4) Section of Meteorology and Hydrography, (5) Division of Municipal Engineering, (6) Gatun Dam and Backfill, and (7) Dredging Division, but for a short time only. On November 10, by direction of the Secretary of War, this officer was relieved of direct charge of all of these units except the Dredging Division,[50] thus releasing his time for devotion to the duties of coördinator and business manager.[51]

Special Canal Commission. Meanwhile, on June 6, 1921, the Secretary of War had issued an order, the pertinent parts of which appear below, presaging further changes in administration:

> By direction of the President, you are hereby appointed a Special Panama Canal Commission to investigate and report upon existing conditions relating to the care, maintenance, sanitation, operation, and government of The Panama Canal and Canal Zone, including all matters affecting the Panama Railroad and the Panama Railroad Steamship Line, and to make recommendations relative to any changes in such conditions affecting the organization, government, and operation of The Panama Canal and Canal Zone, and the operations of the Panama Railroad Company, which you may deem advisable.
>
> It is desired that you make a broad and comprehensive examination into all matters having any pertinent bearing upon the efficient,

[49] Col. Meriwether L. Walker, U. S. A., present Governor of "The Panama Canal."

[50] The other units, including the Electrical Division, were placed under the direct supervision of the Assistant Engineer of Maintenance.

[51] The duties of the Engineer of Maintenance were defined in a circular issued November 22, 1921.

effective, and economical operation of all Panama Canal and Panama Railroad Company facilities on the Isthmus, as well as those affecting the operation of the Panama Railroad Steamship Line. Special inquiry and recommendation should be made regarding the number of employees of The Panama Canal and Panama Railroad and the wages and salaries paid to them, including bonuses, privileges, and other perquisites enjoyed by them. I have verbally given you a general statement of some of the matters which I believe should be investigated, but it is not intended to limit you to any particular line of inquiry and you should, therefore, make all investigations which you deem necessary with a view to making constructive recommendations for such reorganization of The Panama Canal and Zone Government and Panama Railroad Company's affairs as may be considered advisable. In this connection your attention is invited to the Panama Canal Act of August 24, 1912 (37 Stat., 560), which is the organic act providing the manner in which the Panama Canal shall be operated and maintained and the Canal Zone governed.

* * * *

You are authorized to hold such hearings as may be considered advisable on the Isthmus and should give everyone entitled to be heard an opportunity to testify before your Commission or any member thereof, as may be determined, or to submit written statements for your information and consideration.[52]

This Special Panama Canal Commission arrived on the Isthmus, June 18, 1921, and submitted its report on September 15. Among the more important recommendations of the report were the following: (1) Reorganization of the accounting system, (2) charging for quarters occupied by employees and for certain services in connection therewith, (3) opening of the Canal Zone to settlers who might thus be made available for the labor force, (4) reduction of stock in warehouses, (5) leasing of certain parts of the cattle industry and "The Canal" restaurants, (6) placing of sales at commissaries on a money rather than coupon basis, and (7) transfer of posts, customs, quarantine, shipping commissioner, and steamship inspection work from "The Canal" organization to the various departments of the United States Government which were concerned with those services.

All of these were undertaken and put into effect by the Governor except the two last, the former of which was declared to be

[52] Quoted from Executive Orders, etc., 1921, p. 288.

impracticable, the latter being disapproved by the Secretary of War upon objection by the Governor.

Housing. Putting into effect the recommendation that the privilege of free quarters be withdrawn, resulted in considerable disturbance. It had previously been the policy to assign quarters to American employees free of charge and to maintain those quarters as well as to supply light, water, and fuel. Former governors had urged that a charge be made for such services and quarters, and on March 1, 1915, such a plan was put into effect. It was discontinued by order of the President, however, and in the succeeding year when the question arose, postponement was ordered by the President. The successful institution of this practice came about as follows:

> On December 3, 1921, the President signed an executive order directing that on and after January 1, 1922, a charge be made for rent, fuel, electric current, water, and services in connection with quarters occupied by employees of The Panama Canal and the Panama Railroad Co. on the Isthmus. Rental charges were to be fixed on the present depreciated value of the area occupied by the tenant in an amount sufficient to amortize the investment in quarters on the basis of an average life of 36 years, to return 5 per cent for amortization and interest on the investment, and in addition cover the amount fixed for expenditure for repairs due to ordinary wear and tear and for the disposal of garbage and other services necessary from a sanitary point of view.
> * * * *
> The employees applied to the district court of the Canal Zone for an order restraining the Governor from collecting rent charges on the ground that free quarters were a privilege guaranteed them by act of Congress. The court held that it had no jurisdiction, and when an appeal was taken to the United States Circuit Court of Appeals at New Orleans this decision was confirmed. Efforts made by representatives of the employees to have Congress enact a provision restoring the free quarters privilege were also unsuccessful.[53]

The rentals established under the new regulations averaged from $10 to $25 a month for family quarters with necessary furniture, and for bachelor quarters, including janitor service, approximately $9 a month. The total collections from gold employees

[53] Governor, Annual Report, 1922, p. 43.

for rentals during the six months of the fiscal year 1922, in which the regulations were in effect, amounted to $207,944.91.

Land Policy. The report of the Special Canal Commission, as has been noted, resulted in the opening of Canal Zone lands to settlers who wished to engage in agriculture. The Governor's annual report for 1922 outlines the story concisely.

> Since the depopulation of the Canal Zone prior to the opening of the canal it had been the established policy to reserve the land exclusively for Government use, and no cultivation was permitted except such as was carried on by or under contract with the supply department and such gardening as was done by employees on small plots allotted to them in the vicinity of their quarters. With the reduction of the force employed by The Panama Canal and the Panama Railroad Co. large numbers of idle and destitute West Indians congregated in Panama and Colon. With a view to relieving the distress of these people, increasing the food supply and creating a local reservoir of unskilled labor that could be drawn upon when needed, it was decided to reopen certain specified areas in the Canal Zone for cultivation under revocable licenses. Applicants for land were assigned up to 5 hectares, rent free until July 1, 1924, after which an annual rental of $5 a hectare will be collected, and they were given enough second-hand lumber and corrugated-iron sheets to build a small house on each tract. The order relative to these agricultural leases took effect December 2, 1921, and between that time and the end of the fiscal year 1026 licenses had been issued for a total of 3138 hectares. The lessees are in practically all cases West Indians who are employed or were formerly employed on the canal.[54]

In accord with this policy it was decided, after consultation with the Department of Agriculture, to create the positions of agronomist and assistant agronomist in the Supply Department of "The Canal," the incumbents of these newly created positions being expected to develop plant introduction and propagation in the Canal Zone, in coöperation with the Department of Agriculture, and to advise and assist local farmers.

Accounting Reorganization. The accounting reorganization brought about by the report of the Special Panama Canal Commission was extensive and radical. It was initiated under instruc-

[54] *Ibid.*, p. 46. A hectare equals 2.47 acres.

tions from the Secretary of War, issued October 18, 1921, which read as follows:

A careful study shall be made of the cost of the canal, in order to establish, if possible, a capitalization to determine a fair commercial value that should be fixed for the canal and its various allied activities. When this has been arrived at, the actual cost of the canal and its activities will be written down to this figure, which should thereafter be used in the operation and official reports as capital account upon which returns and expenditures should be justified. Having arrived at this figure, it will be subdivided and an allocation be made to each auxiliary activity under the canal administration, and thereafter the sum allotted to each of these activities shall be the one that must be used in justifying the continued existence of the activity concerned; but in case the operations show a loss, the Governor may present to the Secretary of War a statement of reasons why the activity might be longer continued. There are certain activities, such as sanitation, hospitalization, fire and police protection, and other similar governmental functions, which obviously are not activities from which commercial returns can be expected. These should be attached to canal operations proper and the cost thereof borne by canal operations. By capitalizing the canal and its various subdivisions as therein recommended, it is believed that many desirable results will obtain, for thereafter not only the canal as a whole but each of its auxiliary activities will be given a measure by which the efficiency of its operations should be determined.

. . . In the system of acounting there shall be provision made for a complete and independent showing by each separate business activity throughout the Zone, and invested capital (subject to the revised set-up value as elsewhere directed) shall be set up as a direct charge thereto, the accounts showing the actual results of each unit.[55]

Setting up and installing these accounts involved detailed technical procedure of an intricate nature, which cannot be described here, but the results were important as they contributed toward placing information before officers and the public upon which an adequate judgment of the performance of the canal and its subsidiary works, as a business enterprise, could be based.

It was first necessary to arrive at a commercial value of "The Canal" and its various activities. This was finally determined as $275,179,298.25, divided into $246,418,989.81 for transit capital and $28,760,308.44 for business capital. This did not include capi-

[55] *Ibid.*, p. 49.

tal expenditures charged to the national defense, which amounted to $110,997,602.38, as of June 30, 1922.

Two series of accounts were set up, the first showing appropriations, funds, and fiscal officers' allotments and obligations, and the second covering property, income, and operations.

The second series of accounts was divided between:

1. "Canal" transit operations, relating to the transit of vessels through the canal, and
2. "Canal" business operations, auxiliary to or even independent of canal operations proper and intended to be self-supporting.

The transit property was divided into fixed property and equipment. Amortization of the fixed property was based on an expected life of one hundred years, the amount written off being based on a figure which at compound interest at 3 per cent would amortize the investment in the time indicated. Items with an expected life of less than one hundred years were depreciated in lump sum sufficient to maintain similar property in usable condition during the lifetime of the canal.

The practice of providing for the depreciation of equipment by setting up a reserve was continued. The depreciation of business property was based on estimated life, but in many cases large amounts were written off to defense capital investment because larger expenditures had been made than would have been necessary for a solely commercial enterprise.

All revenues from canal transit operations were turned into the general fund of the Treasury, but business operations revenues were divided into three classes: those affecting strictly canal activities in the nature of a reduction in expenses; those affecting the total expenses of canal operation; those which were distinctly business revenues. The first and third classes were repaid to appropriations and became available for expenditure, but the second was covered into the Treasury as miscellaneous receipts.

Provision was made for showing what 3 per cent on the investment on each business unit would be in comparison to actual results, but in practice the interest accrual was not available. "The Canal" took credit for this interest, however, in its accounts.

The Governor at this time made an unsuccessful plea for maintaining the appropriations of "The Panama Canal" on a continu-

ing basis and continuing the reserves already built up as a working fund.

Washington Office. The Washington Office continued without change its functions of caring for recruiting and appointments, correspondence and records and purchasing and auditing. The recruiting and appointing operations fluctuated widely as conditions varied. The experience was as follows:

Fiscal year	Tendered employment	Accepted	Percentage of acceptance
1920	1792	1032	58
1921	704	495	70
1922	448	173	38
1923	542	282	52
1924	973	436	45

Purchasing activities also varied with the needs of "The Canal."

Fiscal year	Number of purchase orders issued	Value involved
1920	8367	$9,133,069.94
1921	7238	6,522,901.08
1922	2629	1,169,248.68
1923	5381	2,351,048.33
1924	7182	4,796,022.22

Grievance Board. A decision was made in 1920 to put into operation a board to hear complaints of American employees and to advise the Governor. As a consequence on July 13, 1920, the following announcement was issued:

1. A board is hereby appointed to make investigations and appropriate recommendations to the Governor in the matter of such complaints of employees concerning working conditions as may be from time to time referred to it. The board will be composed of the engineer of maintenance, two employees as representatives of organized labor, *viz.*, Messrs. W. C. Hushing and Harvey McConaughey, and, in each case, the head of the department or division in whose jurisdiction the complaint originates.

2. The functions of the board are wholly advisory, and its findings and recommendations will not be effective until approved by the Governor.

3. Complaints against administrative policies of the canal, and Panama Railroad will not, in general, be referred to the board; but the Governor may require the board to make recommendations to him on any matter involving the general welfare of employees.

4. The following procedure will be followed preliminary to the reference of complaints to the board: An individual employee or a group of employees belonging to a labor organization affiliated

with the American Federation of Labor will present the complaint to the proper local union or shop committee, who will endeavor to adjust the matter with the immediate superiors of the employee or employees concerned, including division or department heads. Unless adjusted, this complaint will then be submitted to the Panama Metal Trades Council or Central Labor Union, as the case may require, in complete form, and if the proper officers or committees of these bodies cannot arrange satisfactory settlement, the case will be forwarded by them to the Governor, with request for reference to the board. Cases which from their nature require immediate action may be submitted to the Governor by the President and Secretary of the Metal Trades Council or Central Labor Union, with the facts and reasons clearly stated. The complaint may then be referred to the board by the Governor, if practicable.

5. The board is authorized to formulate its methods of procedure.

6. It will be noted that the board is to act on the complaints of members of labor organizations affiliated with the American Federation of Labor only. The right of all employees, individually or collectively, whether members of a labor organization or not, to make complaint to the Governor, will be continued.

7. The bureau of statistics will keep a record of all meetings and proceedings of the board.

8. Additional instructions will be issued from time to time as may be necessary.[56]

During the first year thirty-two cases were reported upon. In 1922, however, but five cases were reported upon, in 1923 three, and in 1924 two. The results would seem to indicate either that the employees were a remarkably contented group or that all complaints which arose were not passing through the board.

Personnel. The variation in the number of employees on the Isthmus subsequent to 1920 was as follows:

	Number of employees		
	Gold	Silver	Total
1920	4650	16,372	21,022
1921	3506	10,035	13,541
1922	2553	7,623	10,176
1923	2583	8,418	11,001
1924	2810	8,701	11,511

A sharp reduction in force is to be noted in 1921, followed by a considerable, though less marked, falling off in 1922. The 1921 reduction resulted partly from the termination of construction work for the Army, with the consequent elimination of the Build-

[56] *Ibid.*, 1920, p. 233.

ing Division, and partly from the general shipping depression, which in turn cut down the work in the mechanical shops and other shipping service divisions. The overhead force did not decrease in proportion to the general reduction and a study was instituted to ascertain where it could be cut down. As a result the executive and health administrative personnel was reduced. The Municipal Engineering Division saw a reduction of some 500 men, due, as mentioned, to termination of Army construction, and in the Dredging Division nearly 300 men were dropped. The Commissary Division reduction was approximately 500 men.

The Governor in 1921 pointed out that for the actual operation of the canal, a force of approximately 3000 men was sufficient, and to carry on the governmental activities (comparable to a combination of national, state, county, and municipal functions in the United States) some 2000 more were necessary. The business operations, which were presumed to pay for themselves and even return a profit, employed a greater number of men than the other two services combined.

Compensation. The wage problem in the Canal Zone offered complications. The law provided that a maximum of 25 per cent might be paid to employees on the Isthmus in excess of the rate received for similar work in the United States. This, however, applied regardless of the class of skilled employee, the variation in difference between the cost of living on the Isthmus and in the United States, and the dissimilarity in general conditions.

In order to keep the proper balance of pay within various groups and not consume the time of executive officers, committees were set up. For clerks and related classes, a committee composed of the executive secretary, the auditor, and the chief quartermaster was appointed.

A wage board also had been set up in 1919, following the practice in the United States, and upon the repeated request of the employees that such a board be established with representation from their group. On March 31, 1919, the following circular letter had been issued by the Governor:

1. Under the date of March 11, 1919, I addressed the following letter to the Engineer of Maintenance and to a representative appointed by the metal trades council:

You are hereby appointed as a board to advise me on wages for the Panama Canal and Panama Railroad employees on the gold roll who are members of the American Federation of Labor.

"(1) The board is an advisory one to recommend rates of pay to the Governor and is without authority to make promises except as to its recommendations.

"(2) This board will recommend wages for positions filled in whole or part by employees who are members of the American Federation of Labor.

"(3) Rates will generally be equal to States' rates plus 25 per cent for similar positions in the government service in continental United States. If there are no similar government positions, canal rates may be based on non-government ones, plus 25 per cent; provided, however, such rates properly coördinate with similar or related ones in the canal service which have been established directly on government ones.

"(4) The board will not make recommendations for individuals but for positions.

"(5) Employees, who are members of the American Federation of Labor, will as heretofore take up matters of wages with their supervisory officers, including heads of divisions. If dissatisfied with the ruling received, they may then submit their claims through the American Federation of Labor to the Wage Board. If the Governor, after having received the report of the Wage Board, disapproves the request in whole or part, it shall not be resubmitted by the individual to the Governor or the board, but may again in not less than six months be resubmitted to the board through the American Federation of Labor local organization.

"(6) The board will hold regular meetings on the first Monday of each month, and such additional ones as are necessary. Requests by heads of divisions and departments, or by the American Federation of Labor for change in wages should be submitted to the Governor at least 10 days before the meeting at which they will be considered. All requests, whether from the American Federation of Labor or from heads of divisions and departments shall be submitted to the board through the Governor, and all replies by the board shall be to the Governor. The board, however, may, in considering rates of pay, ask for such information orally or in writing from any canal employee as may be necessary or desirable.

"(7) The Bureau of Statistics will keep a record of all meetings, and will collect and arrange necessary data, and prepare the basic data of States' rates for use of the board.

"Additional instructions will be issued from time to time as may be necessary."

2. It is the intention of paragraph 5 of the letter above quoted that all matters for the consideration of the Wage Board come to the board through the Governor, as is definitely stated in paragraph 6.

3. All requests for changes in rates of pay should be accompanied by a statement of what is claimed and the reason therefor, only one subject to be treated in each letter.

4. The board will, upon request, hold hearings where those interested may be present in order further to explain their contention. The board desires to point out, however, that such hearings should not generally be requested. All complaints or requests should be clearly and fully stated in writing, so that the time of the board may not be unduly occupied with hearings.[57]

[57] *Ibid.*, 1919, p. 239.

The board held twenty-nine meetings during the fiscal year 1921, making recommendations to the Governor in seventy-one cases, and holding nineteen employees' hearings. In 1922 readjustment in the wage scale of certain trades was made on instruction from the Secretary of War, who, under date of October 18, 1921, wrote:

It is believed that the basis as fixed in the law, of not to exceed 25 per cent above rates paid for similar service in the Government service in the United States, may be recognized as fair, and it is directed that it be used for canal and railroad employees. There are certain rates (notably bases fixed for railroad employees, for building-trade rates, and for rates derived from the latter) which are now too high, and for which a new rate should be fixed. In fixing these rates, whether from Government rates or from commercial rates when no Government employment of similar nature can be conveniently found, consideration should be given to the fact that in some sections of the United States where the rate is higher than in other places the hourly rate is fixed on such a basis as to give a suitable wage per year, taking into consideration the fact that inclement weather may close down employment during portions of the year. Similarly proper consideration should be given to a suitable differentiation betwen maintenance employees and construction employees at the canal, these terms being used to differentiate those holding reasonably permanent positions from those whose employment may terminate with cessation of a construction job.

It is directed that the bases upon which wages are determined be gone over carefully and that they be readjusted along the lines above indicated.[58]

Practically all revisions of scale were downward.

In 1923 a new factor entered into the wage adjustment, as the appropriation act for that fiscal year carried a clause which read (42 Stat. L., 716, 765):

No part of the foregoing appropriation shall be used to pay the salary for any position at a rate in excess of the rate in effect for such position on June 30, 1921.

In 1924 adjustments were made in connection with the rates of most of the American employees to meet new conditions. In this year the annual report devoted considerable space to a pro-

[58] *Ibid.*, 1922, p. 44.

test against the application of the new reclassification of salaries and grades schedule to employees of "The Panama Canal." In connection therewith a survey of rates of pay of employees was taken in May 1924, the results of which showed that, as a whole, employees were receiving 22.9 per cent above rates for similar service in the United States. The decision was finally made that "Canal" employees, outside of the mechanical and allied crafts would be included under the Reclassification Act, but the Personnel Classification Board directed that until further notice positions in "The Canal" service should be allocated to grades and classes in the classification simply upon the basis of then existing salaries.

The procedure followed in fixing the compensation of West Indian or silver employees did not follow the same lines. The general trend of the wages of the employees from 1914 to the fiscal year 1921 had been as follows (per hour):

May 1, 1914[59]..... 10 cents	Nov. 1, 1918.....17 cents
Jan. 1, 1917.....10-12 cents	July 1, 1919.....19 cents
Oct. 1, 1917.....13-14 cents	Feb. 1, 1920.....21 cents
May 1, 1918..... 15 cents	July 1, 1920.....23 cents

In December 1919, a committee representing the West Indian employees had called on the Governor presenting a statement to the effect that wages were not sufficient to support such employees upon a standard of decent living. As a result a special inquiry was made by the labor inspector and data on living costs were brought up to January 1, 1920. A board, composed of the heads of departments and divisions went over these figures and recommended advances. The Governor directed at this time that the board

. . . meet thenceforth on the 15th of the last month of each quarter for the purpose of determining whether changes in living costs during that quarter were such as to indicate changes (either advances or reductions) in rates of pay. The board, in turn, directed that a method of figuring living costs and changes therein be adopted on the basis of actual purchases by West Indian employees at the commissaries for a period of three months. Such a study was made and the results of this form the basis on which rates are now determined.[60]

[59] In 1914 the working day was nine hours; subsequent thereto, eight hours.

[60] Governor, Annual Report, 1920, p. 237.

An advance of the rate of pay was recommended for February 1, 1920, but in spite of this a general strike of West Indian employees was called on February 24, involving between 15,000 and 17,000 men. The strike lasted until March 2, but without serious results. Some 2000 West Indians remained on duty, and these, with American employees, performed the work necessary to operate the canal, feed the force, and provide water and light. Certain of the West Indian employees, subsequent to the strike, requested the British Government to conduct an investigation on the Isthmus and permission to do this was granted by "The Panama Canal."

As the result of the quarterly study of living costs, a reduction in wages of silver employees, amounting to one cent an hour, was put into effect on July 1, 1922, bringing the rate to 20 cents, the monthly rates being cut $2.50, and the per diem 10 cents. Conditions in 1923 and 1924 precluded further reductions, and the existing rates for silver employees remained unchanged. This was due partly to the fact that settlement on the land had absorbed much surplus labor and left a competent permanent force for which a 20 cent rate was justified and partly to the fact that gold employee rates had increased slightly.

Recreation. No changes worthy of comment were made in the recreational and amusement administration. Clubhouses were maintained, together with centers for varied community activities, and all forms of athletics were indulged in. In connection with the clubhouses, many revenue producing activities were conducted as before.

Legislation, 1920-25. During the fiscal year 1920 eighteen acts of Congress were approved which more or less directly affected the affairs of "The Panama Canal." Of these, thirteen were concerned with appropriations,[61] many of which, however, applied to other government departments and only incidentally to "The Canal." Of the remaining five acts one was the National Prohibition Act (41 Stat. L., 305, 322), one dealt with suits in

[61] These were 41 Stat. L., 35, 43, 51; 41 Stat. L., 104, 121; 41 Stat. L., 163, 184, 205, 214, 230; 41 Stat. L., 234, 236; 41 Stat. L., 272; 41 Stat. L., 327, 334; 41 Stat. L., 611; 41 Stat. L., 665, 689; 41 Stat. L., 696; 41 Stat. L., 739, 749; 41 Stat. L., 895, 919, 928, 944; 41 Stat. L., 948, 967, 968; 41 Stat. L., 1022, 1037.

admiralty, salvage service, etc. (41 Stat. L., 525), two were concerned with the admission and deportation of aliens (41 Stat. L., 253 and 41 Stat. L., 593), and the last removed certain tracts of land in Cristobal, C. Z., from the operation of an executive order dated December 5, 1912 (41 Stat. L., 948).

The National Prohibition Act (Section 20) made it unlawful

to import or introduce into the Canal Zone, or to manufacture, sell, give away, dispose of, transport, or have in one's possession or under one's control within the Canal Zone, any alcoholic, fermented, brewed, distilled, vinous, malt, or spirituous liquors, except for sacramental, scientific, pharmaceutical, industrial or medicinal purposes under regulations to be made by the President, and any such liquors within the Canal Zone in violation hereof shall be forfeited to the United States and seized: *Provided*, That this section shall not apply to liquor in transit through the Panama Canal or on the Panama Railroad.

The regulations to be made by the President were put into effect by executive order of January 7, 1920, "Establishing Regulations for the Canal Zone Relative to the Sale, Possession, and Disposition of Liquors for Sacramental, Scientific, Industrial, Pharmaceutical and Medicinal Purposes." [62]

The law dealing with admiralty suits and suits for salvage services had no specific application to "The Canal" except for the provision (Section 1) which said ". . . this Act shall not apply to the Panama Railroad Company."

The next two laws in question, namely, those dealing with the entry and exclusion of aliens, were general in application.

The fifth law merely exempted a tract of land in Cristobal from an executive order "declaring all lands in the Canal Zone necessary for canal purposes."

During the fiscal year 1920, twenty executive orders and proclamations affecting "The Panama Canal" were issued. Of this number seventeen were promulgated by the President, two by the Secretary of War, and one by the Secretary of State.

[62] The sale of intoxicating liquors in the Canal Zone was originally regulated by an ordinance of the Isthmian Canal Commission (Laws Canal Zone 257; April 27, 1907) with various amendments. No licenses were issued for the sale of such liquors after July 1, 1913. Manufacture of distilled spirits had been regulated by Executive Order No. 112, May 13, 1911, but all stills were closed on January 1, 1913, by virtue of Executive Order No. 130, May 21, 1912.

For convenience a tabulation of these orders is appended:

Date	Number	Issued by	Subject matter
July 12, 1919	....	Acting Sec. State	Amending travel regulations with return of peace
July 25, 1919	3130	President	Establishing military reservations
July 31, 1919	....	President	Proclamation: Abrogating regulations governing flying of civilian aircraft
Aug. 8, 1919	....	President	Registry of foreign built vessels
Nov. 24, 1919	3176	President	Acquisition of vessels of hostile nations
Nov. 25, 1919	....	President	Conditions of employment for permanent force
Dec. 22, 1919	....	President	Establishing military reservation
Dec. 22, 1919	....	President	Establishing military reservation
Dec. 30, 1919	....	President	Establishing military reservation
Jan. 7, 1920	....	President	Regulating sale, etc., of liquors
Jan. 9, 1920	....	President	Concerning court costs and security
Jan. 30, 1920	....	Acting Sec. War	Appointment to Joint Land Commission
Feb. 3, 1920	....	President	Applying Executive Order No. 3091 to Panama Canal
Feb. 11, 1920	....	President	Charge for services by quarantine division
Feb. 20, 1920	....	President	Maximum pay for alien employees
Mar. 1, 1920	....	President	Establishing Naval radio station
Mar. 6, 1920	....	President	Carrying and keeping of arms
Mar. 31, 1920	....	President	Maritime quarantine regulations
Apr. 9, 1920	....	President	Establishing military reservation
May 1, 1920	....	Sec. War	Travel expenses—Joint Land Commission

During the fiscal year 1921 legislation affecting "The Panama Canal" was restricted, but twelve acts being approved which bore in any way upon "Canal" affairs. Of these twelve, eight were concerned with appropriations,[63] one amended the Federal Reserve Act (41 Stat. L., 1146), another declared that certain acts of Congress, joint resolutions, and proclamations should be construed as if the war had ended (41 Stat. L., 1359), another related to the landing and operation of marine cables (42 Stat. L., 8), and the last was the National Budget Act (42 Stat. L., 20). None

[63] These were: 41 Stat. L., 1156, 1166; 41 Stat. L., 1205, 1213, 1216; 41 Stat. L., 1252, 1284, 1308; 41 Stat. L., 1315, 1316; 41 Stat. L., 1347, 1351; 41 Stat. L., 1367, 1385, 1408, 1417, 1431; 42 Stat. L., 29, 35; and 42 Stat. L., 68, 87.

of these laws had any vital effect upon the administration of "The Panama Canal," or at least any greater effect than upon other divisions of the government.

Executive orders in 1921 were also somewhat fewer in number, but fourteen being issued, all but one by the President; that exception being promulgated by the Secretary of War. They were as follows:

Date	Number	Issued by	Subject matter
July 12, 1920	....	President	Proclamation: Official opening of Canal
Sept. 1, 1920	....	President	Establishing military reservation
Oct. 2, 1920	3332	President	Leasing of pier
Oct. 30, 1920	....	President	Licensing chauffeurs
Nov. 6, 1920	....	President	Establishing military reservation limits
Jan. 5, 1921	....	President	Amending order relating to tolls
Feb. 26, 1921	....	President	Maximum fares vehicle transportation
Apr. 7, 1921	3427	President	Passport control—aliens entering zone
Apr. 8, 1921	....	President	Amending limits military reservation
Apr. 14, 1921	....	President	Traffic (vehicular) regulations
May 12, 1921	....	President	Stop-overs on passports
May 16, 1921	....	President	Maximum pay—non civil service clerks
June 6, 1921	....	Sec. War	Appointing Special Panama Canal Commission
June 25, 1921	3505	President	Travel between United States and neighboring countries

The fiscal year 1922 saw the consummation of the treaty between the United States and the Republic of Columbia which had originally been concluded in 1914. This treaty, as finally approved on March 30, 1922, provided that Colombia should enjoy the right of transit for troops, materials of war, and ships of war through the Panama Canal without charge, unless Colombia should be at war with another nation; that Colombian products and mails should be exempt from any charges not levied against United States products or mails; that Colombian citizens crossing the Zone should be exempt from all tolls, etc., from which United States citizens were exempt; that in event of blockade of the waterway Colombian troops, materials of war, products, and mails should be transported across the Isthmus by rail at the same rates charged

for similar service to the United States government; and that intercoastal trade in sea-salt, coal, and petroleum between Colombian Atlantic and Pacific ports, in case of interruption to canal traffic, should be given transportation by rail, free of any charge except actual cost of handling and transportation.

Article II obligated the United States to pay to Colombia the sum of $25,000,000 in five annual installments, while in Article III Colombia was bound to recognize the Republic of Panama as an independent nation. In consideration of this last the United States agreed to take the necessary steps to induce the Republic of Panama to send a representative to Bogota to negotiate a treaty

Date	Number	Issued by	Subject matter
July 9, 1921	3513	President	Landing and operation of marine cables
July 27, 1921	3522	President	Navigation rules
Oct. 18, 1921	3562	President	Passport control and entry of aliens
Nov. 2, 1921	3573	President	Leasing of pier space
Nov. 17, 1921	3581	President	Exemption from tolls of vessels transiting Canal for repairs
Dec. 3, 1921	3585	President	Payment by employees for use of quarters, fuel, water, etc.
Dec. 30, 1921	3603	President	Court rules of practice and procedure

of peace and friendship between the Republics of Colombia and Panama.[64]

In the field of legislation the fiscal year 1922 produced some thirteen laws, eight affecting appropriations.[65] Of the others one was a joint resolution declaring the termination of the war (42 Stat. L., 105); one amended the Narcotic Act (42 Stat. L., 596); one dealt with employees' compensation for injuries (42 Stat. L., 650); one was a joint resolution authorizing the Secretary of the Treasury to designate depositaries for public moneys in United

[64] Such a treaty was finally concluded and ratified by Colombia December 5, 1924, by Panama December 23, 1924, and the ratifications exchanged at Bogota January 3, 1925.

[65] These were: 42 Stat. L., 122, 130; 42 Stat. L., 327, 346; 42 Stat. L., 437, 453, 458; 42 Stat. L., 470, 480; 42 Stat. L., 507, 509; 42 Stat. L., 552, 592; 42 Stat. L., 599, 600, 603, 608; 42 Stat. L., 716, 717, 727, 736, 738, 739, 742, 745, 749, 754, 757, 763, 764.

States possessions (42 Stat. L., 662); and one provided additional compensation for employees (42 Stat. L., 712, 713). None of these laws bore any vital significance in connection with "Panama Canal" affairs.

The executive orders issued during the fiscal year 1922 numbered but seven. Two only had any marked effect; one laying down navigation rules and the other requiring payment for employees quarters, etc. They appear in the table, page 139.

Legislation for the fiscal year 1923 followed normal lines, fifteen acts being approved which had direct or indirect bearing upon "Panama Canal" affairs. As usual, the great majority of these acts dealt with appropriations, ten being of this description.[66]

Of the remaining five acts, the first (42 Stat. L., 1004) is most important, as it provided for a reorganization of the judicial framework and procedure and of the penal code. The second provided the legislative authority necessary to give effect to conventions with foreign governments for facilitating the work of traveling salesmen (42 Stat. L., 1028). The third act in question, a joint resolution (42 Stat. L., 1225), dealt with the abrogation of certain executive orders issued in 1904, 1905, and 1911,[67] which had been used as a *modus operandi* between the United States and officers of the Panama government during the construction period. This act gave authority to the President to abrogate the agreement mentioned at his pleasure by repealing the executive orders in question.[68] The fourth law was a private act for the relief of certain former "Canal" employees, and the last was concerned

[66] 42 Stat. L., 767, 781; 42 Stat. L., 786, 795; 42 Stat. L., 1068, 1069, 1072, 1076; 42 Stat. L., 1110, 1121; 42 Stat. L., 1132, 1139; 42 Stat. L., 1154, 1163, 1168; 42 Stat. L., 1174-1215; 42 Stat. L., 1289, 1294; 42 Stat. L., 1377, 1379, 1387, 1396, 1398, 1399, 1402, 1405, 1409, 1416, 1417, 1425; 42 Stat. L., 1557, 1558, 1559.

[67] Order of the Secretary of War, December 3, 1904—Importations into the Canal Zone (Taft Agreement); order of the Secretary of War, December 6, 1904—Importations into the Canal Zone; order of the Secretary of War, December 28, 1904—Establishment of customs administration in the Canal Zone; order of the Secretary of War, January 7, 1905—Entries of merchandise at ports of Canal Zone; order of the Secretary of War, January 5, 1911—Amending orders relative to import duties, and exclusion of tropical employees from commissary privileges.

[68] This was not done until May 28, 1924, by Presidential Proclamation No. 1699. The agreement was permitted to continue until June 1, 1924.

with preserving the status of persons awarded compensation under a previous act (42 Stat. L., 1516).

Executive orders during the fiscal year 1923 were few in number, but six being issued which bore in any way upon "Canal" administration. They were as follows:

Date	Number	Issued by	Subject matter
July 17, 1922	3709	President	Charges for official quarters—Amending executive order of Dec. 3, 1921, on conditions of employment
July 28, 1922	....	Sec. War	Authorizing Marine Superintendent to act as Governor
July 31, 1922	3712	President	Excepting employees at leprosy investigation stations from examination
Nov. 14, 1922	3754	President	Authorizing boxing in the Canal Zone
Dec. 6, 1922	3761	President	Interest on deposit money orders
May 16, 1923	3848	President	Addition to Balboa radio station

The first order mentioned gave authority to "the Governor of The Panama Canal, with the approval of the Secretary of War to prescribe a lower rate of charges for official and other quarters which officers and employees of The Panama Canal and Panama Railroad Company are required to occupy by reason of the office held or the duties performed by them, this to apply only in cases in which the rate of pay to the employee is substantially what it was in 1914."

The other order of importance, the second mentioned, provided for succession in office in case of absence or disability of both the Governor and the Engineer of Maintenance. In such case the Marine Superintendent was authorized to act as Governor.[69]

[69] Other laws and regulations regarding transfer of authority had been made. The Panama Canal Act (37 Stat. L., 560, 564) defined the authority of the Governor and provided for the designation of an army officer to act as Governor in time of war. The executive order of April 9, 1917, vested authority of the Governor in the commander of the United States troops stationed in the Canal Zone. Executive Order No. 3032, January 25, 1919, terminated this control and revested the Governor with power. A memorandum of January 26, 1914, accompanying Executive Order No. 1885 of the same date, had authorized the Engineer of Maintenance to act as Governor in case of the latter's absence or disability.

Of seven laws approved in the fiscal year 1924 which affected "The Panama Canal," all but one were concerned with appropriations.[70] The one exception (43 Stat. L., 389) amended a previous act providing compensation for injured employees.

Fourteen executive orders and proclamations bearing on "Panama Canal" affairs were issued, of which but three deserve comment. The first (Executive Order No. 3938) dealt in minute

Date	Number	Issued by	Subject matter
Aug. 15, 1923	....	Sec. War	Amending previous executive orders regarding traffic laws
Sept. 13, 1923	3903	President	Amending previous executive order regarding exclusion and deportation of undesirables
Oct. 16, 1923	3917	President	Transfer of "Canal" property
Dec. 20, 1923	3938	President	Transit and harbor regulations
Feb. 26, 1924	3965	President	Altering judicial districts
Mar. 5, 1924	3968	President	Pardons, paroles, remission of fines, etc.
Mar. 5, 1924	3969	President	Taxation and costs in certain courts
Apr. 3, 1924	3985	President	Making temporary appointment
May 7, 1924	4006	President	Amending above order
May 28, 1924	1699	President	Abrogation of "Taft Agreement"
May 29, 1924	....	Sec. War	Transfer of "Canal" property
June 5, 1924	4019	President	Adding certain territory to Canal Zone
June 13, 1924	4026	President	Declaring Saturday half-holiday, June to September
June 21, 1924	....	Sec. War	Declaring above order to be ineffective on Panama Canal

detail with transit and harbor regulations for the canal and the approaches thereto, including all waters under jurisdiction of "The Canal." It prescribed general operation and navigation regulations and those applying specifically to pilots, movement of vessels, preparation for, and transit through the canal, rules of the road, whistle and other signals, speed regulations, rules applying to port captains generally and in regard to services and supplies, admeasurement, accidents, defects, and claims, and to radio communications.

[70] 43 Stat. L., 33, 59, 63; 43 Stat. L., 182, 189, 199; 43 Stat. L., 205, 206, 208, 214, 235; 43 Stat. L., 390, 429; 43 Stat. L., 432, 436; 43 Stat. L., 477, 479, 484, 488, 491, 493, 497, 499, 503, 509, 510, 512, 519.

Another document of importance was the proclamation of May 28, 1924, abrogating the so-called "Taft Agreement," under authority granted by Congress during the previous year.

The third order of importance (No. 4019) added some twenty-two square miles of watershed to the Canal Zone, largely to provide additional water storage and impounding facilities and making possible a necessary additional reservoir. This order was possible because the treaty of 1903 with Panama ceded "the use, occupation, and control in perpetuity of any other lands and waters outside of the said zone which may be necessary and convenient

Date	Number	Issued by	Subject matter
July 8, 1924	4047	President	Assigning certain Canal Zone land to the Navy Department
Oct. 17, 1924	4087	President	Appointing a special judge
Nov. 22, 1924	4105	President	Assigning certain Canal Zone land to the Navy Department
Dec. 23, 1924	....	Sec. War	Establishing regulations for the operation of motor vehicles
Jan. 10, 1925	....	Sec. War	Amending conditions of employment
Jan. 12, 1925	4125	President	Documents required of aliens entering the United States
July 28, 1925	4276	President	Rules and procedure for the District Court
Sept. 25, 1925	4314	President	Harbor and transit regulations

for the construction, maintenance, operation, sanitation and protection of the said canal. . . ." After describing in minute detail the boundaries of the newly added territory, it provided for the inclusion of such area in certain administrative and judicial organization districts.

The complete list of executive orders and proclamations for the fiscal year 1924 appears on page 142.

The fiscal year 1925 produced no laws of importance to "The Panama Canal." Of ten acts which affected "Canal" affairs, eight dealt with appropriations,[71] and but one bore any great

[71] These were: 43 Stat. L., 672, 689, 695, 699, 701; 43 Stat. L., 704, 711, 712; 43 Stat. L., 753, 758, 762, 763; 43 Stat. L., 822, 825; 43 Stat. L., 861, 868, 877; 43 Stat. L., 892, 893, 899, 902, 906, 909, 912, 915, 918, 924, 925, 927, 933; 43 Stat. L., 1014, 1015, 1017, 1022, 1023, 1045; 43 Stat. L., 1141, 1182.

significance for "Canal" administration. It (43 Stat. L., 936) was "An act to amend the Judicial Code and to further define the jurisdiction of the circuit courts of appeals and of the Supreme Court."

Executive orders issued during the fiscal year 1925 and the early part of 1926 numbered eight, none of which deserves extended comment. These orders are tabulated on page 143.

This résumé of legislation relating to the affairs of "The Panama Canal" shows little during the post-war period affecting administration in any fundamental manner. As with the physical aspect of the canal, organization and administration had finally reached a stage of stabilization.

Personnel. The limitations of this monograph do not permit of any extensive review of the names so intimately bound up with the successful construction and operation of "The Panama Canal." Volumes are available recounting the accomplishments, from the standpoint of statesmanship, of Roosevelt, Hay, Taft, Root, and Wilson; in the field of construction of Stevens, Goethals, Gaillard, Hodges, Rousseau and Sibert; and in health of Gorgas. The canal stands a silent but eternal monument to these men.

There have been but four Governors, all Army men. The list includes Maj. Gen. George W. Goethals (April 1, 1914, to January 10, 1917), Brig. Gen. Chester Harding (January 10, 1917, to March 27, 1921), Col. Jay J. Morrow (March 28, 1921, to October 15, 1924), and Col. Meriwether L. Walker (October 16, 1924, to date).

CHAPTER II

ACTIVITIES

In theory at least "The Panama Canal" has but one function: to pass vessels through the waterway from ocean to ocean as expeditiously and as safely as possible.[1] In practice and of necessity in carrying out this function it engages in manifold contingent activities, diverse in kind and intricate in detail. These activities, functionally classified, fall under the following heads:

1. Traffic
2. Business enterprises
3. Government
4. Administration

The term "traffic" includes the work of putting vessels through the canal, the maintenance, repair, and construction work necessary thereto, and the enforcement of navigation and inspection regulations.[2]

The business enterprises, broadly speaking, include the activities of "The Canal," which in the United States would normally be carried on by private initiative. Specifically they comprise the supplying of fuel, provisions, ship chandlery, and repairs to vessels and of food and clothing for "The Canal" personnel; the handling of cargo, with allied operations; and the operation and management of the Panama Railroad and the steamship line.

[1] In a larger sense this function might be considered dual in nature, namely, to pass ships through the canal as an international artery of commerce in time of peace and to serve as a vital factor in the national defense in time of war. The latter is important here only in so far as it accounts for certain capital investment or plant in excess of purely commercial needs with the consequent tendency to reduce the successful showing of "The Canal" as a commercial enterprise.

[2] Certain of these activities impinge upon the field of "government" and of "business" as here classified, but it must be borne in mind that the classification is arbitrarily adopted for purposes of description.

In general the governmental activities are those which usually fall to the various organization units of federal, state, county or municipal governments in the United States. Such matters include diplomatic relations, posts, customs, vessel inspection for various purposes, immigration, prohibition enforcement, courts, penal and eleemosynary institutions, public safety, public works, education, health, and recreation.

"Administration" as here used includes general management and supervisory activities in connection with, and provision of personnel and matériel for, the carrying out of the various traffic, business, and governmental duties.

Traffic. Although the main concern of "The Canal" is putting ships across the Isthmus, only one-fifth, approximately, of its force is engaged in this work, which includes the handling of ships, the operation and maintenance of locks and the preservation of a clear channel. These phases of the traffic activities may well be discussed under the heads of "navigation" and "operation and maintenance."

Navigation. A recital of the activities concerned with the passage of ships through the canal is most logically presented, perhaps, by describing them as nearly as possible in the order of occurrence as a ship approaches, transits, and leaves the canal.

Harbor Approach. Masters of ships desiring to use the canal are required to get into radio communication with port captains of "The Canal" at the earliest practicable time, and at least twenty-four hours previous to arrival, in order to report the prospective time of arrival in the harbor, general requirements as to supplies, etc., draft and length of ship, amount of local cargo, number and class of local and through passengers, sanitary condition of vessel, sickness on board, if any, and number and class of persons on board subject to quarantine, if any.[3] Vessels are also requested to arrive off the canal entrance, if possible, in the early morning or forenoon.

Incoming ships are met by a boarding party inside the breakwater if at the Atlantic end of the canal, or off the seaward end

[3] Agents of various lines are also requested to keep port captains informed of the prospective arrival and requirements of their vessels and to keep their own ships and principals fully informed on all matters pertaining to "The Canal."

of the dredged channel if at the Pacific entrance. This party consists usually of a pilot, a quarantine officer, who is also concerned with immigration matters, a customs officer, an admeasurer, and a commissary representative.[4] Ships arriving between sunrise and 10 p. m. are boarded upon arrival. Those arriving after that hour are required to anchor in a designated area, and await the boarding party at sunrise. Ships desiring a pilot to meet them outside the Atlantic breakwater are expected to remain there and make signals to that effect.

Detention. The process of inspection by the boarding party, may result in the detention of a vessel upon the discovery of violations of regulations. Such violations are of numerous kinds, one of which deals with type of cargo.

"Canal" authorities have power, upon inspection, to deny passage through the canal to a vessel which carries a cargo of such nature or condition that it might in any way endanger the structures pertaining to the canal because of being explosive or highly inflammable. The right is reserved to impose such safety measures as may be deemed necessary for any such vessel while in "Canal" waters. The regulations provide with great strictness just where boats loaded with dangerous cargo may anchor, the kind of signals they must fly, the hours they may travel, and the procedure they must follow.[5]

In cases where the condition of cargo, hull or machinery of a vessel is found to be such that it is likely to endanger or obstruct the canal, permission to enter or pass through the channel may be refused until the defect has been remedied.

Quarantine. Another possible cause for the detention of ships lies in quarantine regulations. All air, surface, and submarine craft with the crew, cargo, and passengers, are subject to quarantine inspection (except vessels clearing from ports of the Republic of Panama which are known by the quarantine officer to be free from quarantinable disease), and are held to be in quarantine from the time of arrival until released by a quarantine officer.

[4] All of these officers are employees of "The Panama Canal" and not, as might be expected, of the Customs Service, the Immigration Service, the Bureau of Navigation, or the Public Health Service.

[5] Rules and Regulations Governing Navigation, 1925; Regulations 11.2, 47.3, 47.5, 47.6, and Rule 73.

"Pratique"[6] without inspection may be granted in the case of naval vessels of any nation, or other vessels under certain conditions. Radio request must be made the day before this special pratique is desired, and be accompanied by a list of the ports visited in the previous ten days and by a statement that there is no sickness aboard and that the vessel intends to touch at or transit the canal without taking on or landing cargo or persons. For naval vessels such information must be supplemented, within twelve hours after arrival at port, with a confirming certificate signed by the senior medical officer and approved by the commanding officer. In the case of either type of ship the pratique is provisional and is not considered as finally granted until the commanding officer or master has been so notified by the Chief Quarantine Officer.

In case a special pratique has not been requested, the normal routine is followed. The master of the vessel in such cases must have ready for immediate presentation to the inspecting officers, a copy of cargo manifests, all certificates of a sanitary nature, an original bill of health issued at a port of clearance and supplementary bills of health from each port touched en route, together with accurate lists, including the name and status of each person on board. Passengers and crew must also be ready for personal inspection. Quarantine officers may inspect bills of health, certificates of a sanitary nature, clinical records of all cases treated during the voyage, cargo manifests, crew and passenger lists, ship's log, and other records as desired, as well as crew and passengers personally. At the discretion of the quarantine officer, however, a written statement, attested under oath by the master of the vessel and by the surgeon (if any) may be accepted in lieu of complete inspection.

The detention of vessels in quarantine is permissible under the following circumstances:

If there is quarantinable disease on board, or if there has been such disease on board during the voyage; if the quarantine officer believes the vessel or its crew, passengers or cargo, to be infected with quarantinable disease; if the vessel has received on board any person or article from another vessel subject to quarantine; if the quarantine officer considers that the conditions on the vessel

[6] That is, release or permission to dock, come alongside other vessels, or transit the canal; in effect a "clean bill of health."

in any other respects are such as to endanger the health of persons or animals in the Canal Zone or the cities of Panama and Colon, Republic of Panama. The period of detention in quarantine shall be that which the Chief Quarantine Officer considers necessary.[7]

The rules state further that the quarantine officer is authorized

to detain in quarantine, either on board the vessel or in a quarantine station, any or all of the crew and passengers of a vessel, and any other person whom he may consider to have been exposed to infection with quarantinable disease; and also to detain in quarantine, either on board the vessel or in some other place designated by him, any or all cargo which, in his opinion, is infected with quarantinable disease.

Persons in quarantine infected with any communicable disease not specified as quarantinable, as well as those exposed to infection from such persons, may be detained until disposition has been directed by the Chief Health Officer.[8]

For purposes of detention the following diseases have been specified as quarantinable: cholera, yellow fever, smallpox, typhus fever, leprosy, plague and anthrax.[9]

But one quarantine station is maintained, namely, at Balboa. Persons arriving at Cristobal who require hospital treatment are transported across the Isthmus by means of a hospital car on the Panama Railroad.

Fumigation of ships for the elimination of rodents affords another cause of detention. It is required under the following conditions:

Vessels on arrival at a port of the Canal Zone, or the ports of Panama or Colon, Republic of Panama, will be fumigated for the destruction of rodents as follows: (a) A vessel which calls at a plague infected port and there takes on cargo, and which has as its terminal port a port of the Canal Zone or the port of Panama or Colon, Republic of Panama, will be fumigated every trip. If no cargo is taken on at the plague infected port, fumigation will not be required more often than every three months. (b) A vessel which calls at a plague infected port and which does not have as its terminal port a port of the Canal Zone or

[7] Rule 112. The length of detention is determined by the Chief Quarantine Officer.

[8] Rule 113, Regulation 113.1.

[9] For animals: glanders, anthrax, tuberculosis, foot and mouth disease, contagious pleuro-pneumonia, rinderpest, and surra.

the port of Panama or Colon, Republic of Panama, and which takes on or discharges cargo in the Canal Zone or in the port of Panama or Colon, Republic of Panama, will be fumigated every six months unless the master produces a certificate showing that fumigation has been performed in a satisfactory manner within six months. If no cargo is taken on or discharged at a port of the Canal Zone or the port of Panama or Colon, Republic of Panama, fumigation will not be required at six-month intervals. (c) A vessel, irrespective of ports of call, will be fumigated at least once a year unless the master produces a certificate showing that fumigation has been performed in a satisfactory manner within a year.[10]

A schedule of charges is maintained to cover services rendered in the disinfection of vessels and cargoes, the transportation and subsistence of passengers while in quarantine, placing guards aboard vessels when necessary, and inspection of vessels outside of regular hours.

When the quarantine inspection has been completed the quarantine officer may grant free pratique, or provisional pratique, or detain the vessel in quarantine.

Free pratique authorizes the vessel to transit the canal, to dock, to communicate with the shore, to take on and discharge passengers and cargo, and to do such other things as are legal and customary. Provisional pratique authorizes the vessel to do, or requires it to abstain from doing, certain things which are specifically set forth in writing by the quarantine officer. Failure to conform to the conditions of the provisional pratique shall render it null and void and the vessel shall at once return to its previous status.[11]

At the termination of quarantine or release from provisional pratique, a certificate of pratique is granted to the master of the vessel, and the vessel is then permitted to dock or transit.

Immigration. Detention of vessels may result from the violation of immigration regulations, which, in general, are those of continental United States. Chinese are prohibited from entering the Canal Zone, and Chinese, Turks, Syrians, and North Africans of Turkish race are prohibited from entry into the Republic of Panama. No vessel carrying such aliens may be cleared until all

[10] Regulation 117.1. Vessels must also be fumigated before entering dry dock in the Canal Zone.

[11] Rule 108.

the passengers and crew of the races or nationalities mentioned have been declared and mustered for check by a customs inspector.

As with the immigration laws of the United States undesirable persons are excluded from the Canal Zone, but under separate local instructions which define such persons as follows:

The insane or persons who have been insane within five years previous to their attempted entry into the Canal Zone, imbeciles or feeble-minded persons, epileptics, persons suffering from a loathsome or dangerous contagious disease, criminals, those who have been convicted of felony, paupers or professional beggars, persons of notoriously bad character, anarchists, those whose purposes it is to incite insurrection, and any other persons whose presence, in the judgment of the Governor, would be a menace to the public health or welfare of the Canal Zone, or whose presence would tend to create public disorder or obstruct the operation or maintenance of the canal, or who are liable to become a public charge.[12]

Customs. The customs regulations and activities of "The Canal" come under the head of "government," the only phase affecting the transit of vessels, or better, their detention, being in regard to opium. Not only is smoking-opium or opium prepared for smoking forbidden entry into the Canal Zone, but it may not even be carried as a part of the cargo of a vessel touching at Canal Zone ports or transiting the canal.

Admeasurement. Admeasurement forms another feature of inspection under which a vessel may be detained. It is expected that vessels desiring to go through the canal will provide themselves in advance with a proper tonnage certificate based upon the rules laid down for "Panama Canal" measurement, which can be obtained in the ports of the United States and from certain designated officers abroad. A vessel not so provided is expected to furnish a full set of plans and a copy of the measurements made when she received her national tonnage certificate, as well as that certificate itself.

In case none of these data is available, the boarding admeasurer will measure the vessel before transit, levying a charge of fifty dollars for the service.[13] The measurement certificate may be taken

[12] Rule 120.

[13] Complete rules for measurement are found in the pamphlet accompanying Presidential Proclamation No. 1258, November 21, 1913, or in Governors' Circulars No. 601, p. 2, 660, p. 50, and 673.

up by the admeasurer and retained until the next visit of the vessel.

Ships' Papers. Upon arrival ships are required to produce immediately, for use of the boarding party, the following papers:

1. Panama Canal tonnage certificate
2. National register
3. Passenger list
4. Crew list
5. Clearance from last port of call
6. Bill of health
7. Ship information sheet
8. Manifest of local cargo
9. Cargo declaration or complete manifest
10. Descriptive list of Chinese on board
11. Store list
12. Statement of fuel account
13. Pratique
14. Fumigation certificate
15. Birth and death certificate
16. Orders for supplies
17. Report of changes in structure or in the use of spaces since last transit

These papers must be ready for inspection, or taking up if required, and must be sworn to by the master or agent of the vessel before the boarding officers, who are authorized to acknowledge depositions and administer oaths.

After all conditions previously outlined have been complied with to the satisfaction of the boarding party the vessel is ready to take up transit of the canal. The first step, naturally, is the approach to the locks.

Dispatching. "Canal" officers may dispatch vessels through the canal in the order and at any time they see fit. Priority of arrival at a terminal does not give a vessel the right of transit ahead of any other vessel, arriving later. In practice, however, this is the first consideration in determining the order of passage, the second being the amount of work ships have to do in port. Steamers carrying fifty or more through passengers are given preference over other vessels in transiting, provided they have reported in advance by radio the number of passengers on board.

A prearranged time schedule is maintained for the dispatch of vessels through the locks. Vessels arriving inside Cristobal break-

water prior to 1.30 p. m. and at Balboa sea buoys before 2 p. m. are put through the canal on the same day. When southbound traffic is light, an additional ship may be dispatched from Balboa, provided it can arrive at the first lock prior to 3.30 p. m.

Approaches. Numerous preliminary requirements have to be met before a vessel arrives at the locks. In general "The Panama Canal" pilot is sole judge as to whether a vessel is ready for entrance to the locks and for transit pending reference of the matter to the port captain. Unless specifically exempted by the Governor, no vessel is permitted to enter or leave a terminal port, maneuver, shift berth, go alongside, or leave any dock or wharf in "Canal" waters or to pass through the canal without having on board a regularly authorized government pilot and having obtained specific authority from the port captain. Pilotage for vessels in transit through the canal is furnished free of charge.[14]

The "Canal" pilot is placed on board merely in an advisory capacity and the master of the ship is responsible, except in the locks, for safe handling and proper navigation, subject to rules and regulations of "The Canal" as interpreted by the pilot.

All vessels are required to take the berth or dock assigned to them by the port captain upon entering the port.

The first requirement for the physical condition of the vessel in entering the locks is that it be properly trimmed. The maneuvering and steering qualities of a vessel also require inspection, and, if unsatisfactory, correction before canal entry is permitted. Masters are required to prepare accurate tables showing their compass error and, when necessary, additional rudder area must be provided. Vessels are required to have hawsers, lines, and fenders ready for warping, towing, mooring, and passing through the locks, and to keep both anchors ready for letting go. The master must assure himself, by actual test, of the readiness of his main engines, steering gear, engine room telegraphs, rudder and engine indicators, and anchors. Vessels carrying deck load must have it so arranged that it will be clear of all chocks, bitts, and other gear used in locking. At least one boat for handling lines must be kept ready for lowering.

[14] Unless a vessel, in "Canal" waters, discharges or receives freight or passengers, or takes on supplies, provisions, stores, or fuel, or remains to carry on repairs, or makes either terminal a port of call, in which case the vessel is liable for pilot fees.

Certain general rules apply to harbor terminals, locks, and channel. If it is deemed necessary to shift any vessel from its anchorage for any reason, the change is made by direction of the port captain, and towing or other expenses thereby incurred are charged against the vessel. No vessel at any dock or mooring within the canal is permitted to disable her engines or otherwise render herself inoperative except on specific permission of the port captain. Further, no vessel is permitted to anchor in any part of the canal except in an emergency. Anchorage may be made in Gatun Lake, in specified areas outside the channel prism, or moorings may be effected at the approach walls of locks or established mooring stations by permission of a port captain.

Providing all conditions mentioned have been properly met, a vessel may enter the locks, the maximum speed permitted in the channel approach being six knots and in proximity to the locks two knots.

Lockages. " The Panama Canal " assumes responsibility for injury to vessel, cargo or passengers due to accidents caused by the passage of the vessel through the locks. This responsibility is assumed from the time the first towing line is made fast on board, before entrance, and continues until all towing lines are cast off on leaving the lock chamber, but exists only in case the vessel has complied with all rules and regulations, and if motive power, steering gear, and other appurtenances for controlling the ship function properly.

Vessels in locks must keep a full watch on deck and in the engine room, the captain or master must be on the bridge, and all other officers must be at their regular stations. Deck officers must remain at their posts while the vessel is in the locks. In addition to the regular engineer officers of the watch, the chief engineer of the ship is required to remain on duty in the engine room. A full head of steam must be maintained at this time.

Vessels are towed into the locks and handled by the electric towing locomotives or " mules," using one-inch steel wire towing lines. Normally the number of locomotives used is:

Length of vessel	Number of locomotives
Up to 349 feet	4
350 to 499 feet	6
500 feet and over	8

These numbers may be changed according to conditions of list, trim, and construction of the ship, in the judgment of the pilot. Detailed requirements are specified as to towing wires, chocks, bitts, etc., aboard ship. Two deck hands for each locomotive-wire are placed on board the vessel at the terminal port prior to transit to assist the crew.

Ships passing through the locks are towed by the electric locomotives in all but occasional instances. In exceptional cases, where "Canal" equipment is not available or the vessel is extremely small, the vessel's own motive power may be used, but at such times the officers and crew are expected to render such assistance as is necessary to supplement the lock force.[15] "Canal" officers may require a ship to take a tug in approaching the locks (or elsewhere in the canal) if in their opinion it is necessary to insure the safety of the vessel or the canal structures.

Passengers are not permitted to embark upon or leave a vessel in the locks except upon a pass from the port captain's office or upon special authority from the Governor.

These regulations cover in general the requirements imposed upon a vessel before and during lockages. The actual process of locking a vessel through the chamber is well detailed by a lock superintendent.[16]

When everything is in readiness for a lockage the arrow signal at end of approach wall is set to enter.

A small boat with a pilot aboard meets vessel some distance from end of approach wall, unless ship ties up at approach wall before the pilot returns from the previous lockage. Small boats with linesmen aboard and linesmen on the approach wall stand by to receive lines from ship and assist vessel to tie up along approach wall if necessary. In general the vessel comes in close alongside center approach wall and moves toward lock chamber under own power. Light manila heaving lines are cast from shore by which cables from locomotives are pulled aboard by ship's winches or linesmen. As soon as cables from bow locomotives are aboard and made fast a strain is placed on these lines at signal from the lock pilot and ship is drawn away from approach wall and forward toward lock chamber, and at the same time cables from other locomotives are taken aboard. The use of a small boat is necessary to get cables aboard from locomotives on side walls. When time is available the water level is equalized before arrival

[15] Vessels being towed through the locks may, if necessary, use their main engines in ahead motion only when starting out of a chamber and in reverse only in emergency to stop the ship.

[16] Quoted from Governor, Annual Report, 1915, p. 69, but revised to suit present practice.

of ship and gates are opened, but fender chain is left up until ship is under control of locomotives. Ship's engines are stopped before bow of vessel passes fender chain.

The man in charge of lockage representing the lock force carries a portable phone which can be connected with the control house at any lamp-post on lock walls. He notifies control house when to lower fender chain and when to close the gates. The proper time for opening gates is indicated to control-house operators by the indicators on control board. All gates are under observation from the control house and cracking of gates caused by overtravel of water may generally be observed. Attempt is made to open gates just as soon as they crack so that reverse head assists the operation.

From time locomotive cables are aboard every movement of locomotives is made in response to standardized signals from lock pilot. Locomotives have a towing speed of either one or two miles per hour. They slacken cables before ascending or descending inclines. During the course of the lockages the ship's engines are used only to assist locomotives in starting and stopping the ship. The breast locomotives assist the bow locomotives in starting the ship and then drop back during the tow and assist stern locomotives in stopping the ship. On up lockages steel ship cables are attached to snubbing buttons on lock walls to assist locomotives to steady ship in lock chamber during filling.[17] When ready for the water the lock pilot signals the man in charge of lockage who phones the control-house operator. On down lockages steel cables are held in readiness but are not attached to snubbing posts because locomotives can easily hold ship steady in lock chamber. After water in last chamber is equalized with sea level or lake level, as the case may be, and gates are opened, the locomotives are used only to steady ship in chamber until propeller is started, after which locomotive cables are cast off and the ship leaves the locks under its own power. With strong beam winds and ships well out of the water the locomotives are used to steady the ship until stern clears the last gates.

On up lockages a pilot boat is used to pick up the lock pilot after the vessel leaves the lock chamber. On down lockages a counterweighted gang-plank running on wheels is used and pilot comes ashore on center wall just before locomotives' lines are cast off.

Tunnel operators with silver helpers follow the course of the lockage and stand by during operation of each machine.

The fender chains for protection of gates are lowered as soon as gates are opened but are raised just before the gates are closed.[18]

Tandem lockages, that is, two ships in same chamber at same time are frequently made where the aggregate length of the ships is not more than 750 feet. A tandem lockage generally takes about ten minutes more time than a single lockage.

Parallel lockages, being the simultaneous use of both east and west chambers at the same time, are made only in emergencies to avoid undue delay to vessels.

* * * *

[17] This is because on up lockages the water enters the bottom of the lock and causes considerable agitation. On down lockages the water is drawn out of the lock so there is no agitation.

[18] Gates and fender chains are so interlocked on the control board that the chains must be up whenever the gates are closed.

Lockages [may be made] . . . at less than regular lockage intervals, that is, with one ship in first lock while another ship [is] . . . still in third lock.[19] In this manner ships may follow each other through the locks at about one-half hour intervals. Small tugs and launches that can pass under the locomotive cables can be locked down while two or more ships are coming up, or vice versa; also tugs and barges of light draft may be locked through in two lifts by combining middle and lower locks.

The lock pilots must be capable and experienced men in handling ships and must also be familiar with the operation of towing locomotives. The official in charge of the lockage from the lock force supervises the operation of his force, and machinery from the lock walls and sees that the signals of the lock pilot are promptly and correctly obeyed.

To facilitate arrival of ships at lower entrance the gates are left open all night or one gate is opened at 6 a. m., so that currents may die out before arrival of first ship. At other times providing time is available, spilling is completed and gates are opened before vessel reaches one-half mile point or these operations are delayed until vessel is made fast.

Channel Navigation. Having passed through the locks at either end of the canal, the vessel faces the navigation of the main channel, which includes the journey across Gatun Lake and through Gaillard Cut. While the master of the vessel is charged with full responsibility in navigating the canal, he is required to consult with the pilot at all times. Should any ship officer give or cause to be given any order changing the direction or speed of a ship without the knowledge, or against the advice, of the pilot, and such action results in damage, the officer is held directly responsible and the vessel may be detained until settlement in full is made. The pilot also may require a vessel to stop, anchor or moor while he sends a report to "Canal" officers, when in his opinion the ship officers have failed to heed his advice.

The master or a qualified representative of the vessel must remain on the bridge at all times to advise the pilot of peculiarities of handling of the ship. Should any defect develop in a vessel during transit which might interfere with further passage of the vessel, it is required to stop and anchor or moor at the first available place and report immediately to the port captain. Vessels displaying bad steering qualities are to be reported and the services of a tug requested for assistance through the Cut, the same holding true for vessels which are likely to become unmanageable. "Canal" tugs must be used since no tug, launch, lighter, or other

[19] This is applicable only to Gatun Locks where there are three lifts.

floating equipment may be maintained or operated within canal waters without permission of the Governor.

The rules of the road, signals, and other regulations for canal transit are elaborate and detailed, such as would prevail in any fairly narrow or tortuous navigable waterway, and do not depart in principle from standard marine practice.[20]

The maximum speeds, in knots, for the canal, are as follows:

Colon to Gatun Locks	6
Gatun Lake in 1000-foot channels	15
Gatun Lake in 800-foot channels	12
Gatun Lake in 500-foot channels	10
Rounding Bohio and Darien bends	6
Gaillard Cut	6
In or near a lock	2
Miraflores Lake to Pacific entrance	6
Entering or leaving port	6

In rounding bends the slowest speed at which steerageway may be maintained is required, while special rules are applied to Miraflores Lake. Vessels 360 feet or less in length and with a draft of less than twenty feet are required to consume at least fifteen minutes in crossing the lake, larger vessels must consume at least twenty minutes, and those of exceptional size and displacement at least twenty-five minutes.

When vessels are proceeding in the same direction, one may not pass the other except in certain designated stretches of Gatun Lake, and then only upon advice of the pilot. Vessels are not permitted to run side by side nor, in general, to moor alongside each other. No vessel is permitted to enter or navigate Gaillard Cut except in charge of a "Canal" pilot, unless it be specially authorized by the Governor or belong to "The Panama Canal," under penalty of arrest for those responsible. Movements of vessels in the Cut are regulated by the port captain at Balboa, through the signal stations and Pedro Miguel Locks.

Toll and Fee Collection. Payment of bills for tolls and services rendered by "The Canal" or the Panama Railroad must be made to the Collector of "The Panama Canal" either at Balboa or Cristobal. All charges to be incurred must be covered by deposits of funds before the services may be rendered or the supplies furnished, and all bills must be settled in full before a vessel

[20] These may be found in detail in Rules 46-88.

is allowed to clear. Deposits to cover tolls and other bills may be made with the Treasurer of the United States or with a Federal Reserve bank in the United States to the credit of the Collector, in lieu of cash.

Amounts chargeable against vessels are deducted from deposits as soon as possible after the ship has passed through the canal, and a statement of account is sent to the depositor of funds.[21] Shipping lines may make a lump sum deposit with "The Canal" against prospective tolls and carry an open account, specifying by name the vessels to which the deposit is to apply.

Tolls are levied according to the net tonnage of a ship, the rate for laden vessels being $1.20 per net ton, "Panama Canal" measurement, and for vessels in ballast, 72 cents per net ton.[22] To accord with the law, however, provision is made that the amount collected shall not exceed the equivalent of $1.25 per net ton as determined by the United States rules of registry, nor be less than 75 cents per net ton on the same basis. Exemptions from tolls are made in cases where a vessel is transiting for repairs or where it passes into Gatun Lake and back through the same locks.

Clearing. Outgoing vessels are required to obtain a clearance and bill of health before departure. The port captain has authority to clear vessels, but he may not issue clearance until he has satisfied himself:

1. That all required documents and statistical data in regard to vessel, cargo and passengers have been furnished by the master of the vessel or that arrangements have been made to furnish such data through an agency on the Isthmus.
2. That all tolls and other bills for services and supplies furnished by "The Panama Canal" or the Panama Railroad have been paid or that payment has been secured.
3. That the vessel has complied with the quarantine and immigration laws and regulations of the Canal Zone.
4. That the laws and regulations governing the shipment and discharge of seamen and for the protection of seamen have been complied with.

[21] Unexpended balances are remitted with statements except when it is desired to apply the balance against charges on other vessels making, or to make, transit.

[22] A "net ton" is one hundred cubic feet of capacity. Tolls have no relation to type of cargo carried, but only to the capacity of the ship.

All regulations having been adhered to, the vessel is free to proceed from port and the transit is completed.

Operation and Maintenance. To make possible the safe and expeditious transit of vessels through the canal, a channel adequate in width and depth and properly marked must be maintained, water supply sufficient to provide for lockages, electric power generation and to insure proper channel depth must be available, electric current must be generated for various uses, the locks must be operated, maintained, and repaired, and disabled or sunken ships which might hamper navigation must be quickly and properly disposed of.

The operating and maintenance duties fall generally into groups according to the object to which they apply. These may be classified under the head of:

1. Water supply
2. Channel
3. Power
4. Locks

Water Supply. The provision of water supply for the canal involves first, the study and report upon meteorological and hydrographic conditions; second, the estimating of future consumption and the making of investigations preparatory to meeting this prospective need; third, economy in usage; and fourth, maintenance of dams and operation of spillways and culverts. These phases of the water supply problem apply, obviously, to the primary function of the canal, that is, the transiting of vessels, and involve the provision of deep water and the production of hydro-electric power for lock operation. Other duties, such as producing hydro-electric power for business enterprises, supplying water to transiting ships for boiler and other uses, and providing a potable supply for municipalities and other communities belong respectively in the field of "business enterprises" and "government."

The meteorological and hydrographic work is concerned with the gathering of data and reporting upon precipitation, run-off from water sheds, air temperature, winds, atmospheric pressure, humidity, evaporation, seismology, cloudiness, fog, tides and water temperatures, that is, all natural phenomena, except perhaps slides, which may affect the water supply and navigation of the canal.

The work is, with some additions, that which the Weather Bureau performs in the United States and as such might well be considered a "government" function, except that it is so intimately related to the transit of vessels.

Permanent records of rainfall conditions in the Canal Zone, and the hydrologies of the Gatun and Miraflores Lakes watersheds and the Chagres River are kept,[23] in addition to a record of hydrographic conditions at the canal terminals. Special investigations and reports are made from time to time as required. Flood warning stations are maintained at strategic points, and warnings of major freshets are issued to all "Canal" interests which would be affected. In the case of serious floods the hydrographic office, in effect, "directs the campaign" against the rising waters, especially with regard to lake level and the spilling of water.[24]

Second only to rainfall and run-off observations in importance and intimately connected therewith, are the evaporation records. These are kept, especially with regard to Gatun Lake, as one of the main factors in recording water consumption.

These two classes of observation and record deal with matters beyond control, that is, rainfall and evaporation. A third class is concerned with controllable factors, including leakage, municipal use, power generation, and lockages.

The water supplied to Miraflores Lake from its own watershed is negligible during the dry season and the water from Gatun Lake must be depended upon. It enters both through lockages at Pedro Miguel and through by-passing upon need. Gatun Lake thus supplies Pedro Miguel and Miraflores lockages and helps dilute the salinity of Miraflores Lake.

Tables are regularly prepared covering important phases of the water-supply problem. They include the following titles:

1. Monthly rainfall in the Canal Zone and vicinity and statistical averages.
2. Maximum rainfall in the Canal Zone and vicinity.

[23] Standard rain-gage stations are maintained outside the Canal Zone at numerous points, usually in coöperation with another government agency, such as the Weather Bureau or the Navy Department, "The Panama Canal" being under the expense of furnishing the rain-gage. In 1925 there were forty-two rain-gage stations operating under "Canal" jurisdiction, eighteen of them being outside the Zone.

[24] See House Hearings on War Dept. Appropriation Bill, 1925, p. 1766.

3. Monthly meteorological data, Balboa Heights and Cristobal.
4. Monthly evaporation in the Canal Zone.
5. Tidal conditions (year).
6. Principal freshets in Chagres River (year).
7. Monthly discharge, Chagres River at Alhajuela.
8. Monthly hydrology, Gatun Lake.
9. Hydrology Gatun Lake and Miraflores Lake watershed (year).

The hydrologies of Gatun and Miraflores Lakes also supply important data which are kept for comparative purposes and indications of needs.

The necessity of constant inspection, careful records, and adequate forecasting of conditions is illustrated by a statement of the violent fluctuations from dry to rainy seasons of the main source of water supply, the Chagres River. This stream in 1923 showed a minimum momentary discharge of 414 cubic feet per second and a maximum of 108,800.

The conservation of the supply of water on hand may be brought about by economizing in use of water during lockages, relieving the hydro-electric generating plant with the steam plant, eliminating leakage, and cutting down municipal consumption. Since leakage and municipal use together consumed (1926) but one per cent of all the water used, conservation at these points does not assume major importance.

Economy in lockages is a more important factor, though only partially controllable. Vessels must be passed through the locks when they arrive, and adequate water must be provided to care for this, but certain economies may be practiced. "Short-chamber" lockages may be used, that is, only the space between the intermediate and an end gate filled. Again, with the locks so constructed that water may be passed across through the center wall from one parallel chamber to another, ships may be "locked up" in one chamber with at least one-half the same water that has just been used in "locking down" a ship in the other. Again by "alternate lockages," two ships may be locked in one net expenditure of water, that is, locking ships consecutively in alternate directions in the same chamber. A third method is "tandem" locking, that is, putting more than one ship in a chamber at a time. These savings are considerable, as is shown by the fact that

whereas about 7,000,000 cubic feet of water is drawn from Gatun Lake for a complete through lockage in the wet season when water is plentiful, this amount was reduced in March 1926 to 4,300,000 cubic feet.

Consumption of water for power generation is wholly controllable, since if necessary all current may be generated during the entire year by the steam auxiliary plant at Miraflores. This plant is maintained ready to take over the power generation load at any time, and is utilized primarily during the dry season to cut water consumption and help maintain Gatun Lake at proper level until it again begins to fill from rains. For instance, in the fiscal year 1924:

> The Miraflores station was maintained on the basis of stand-by service and was required to carry load on forty-four occasions. From January 1 to March 10 it carried the major portion of the load on the power system, thus relieving the hydro-electric station at Gatun and conserving the water in Gatun Lake against a possible dry season shortage.[25]

Experiments also revealed that some 2,250,000,000 cubic feet of water per month could be saved by substituting the plant at Miraflores for the hydro-electric plant at Gatun. The total savings of these two measures together, over the average dry season, would be equivalent to 3.5 feet of storage in Gatun Lake.

The next step after conservation in the process of assuring ample water supply lies in obtaining a greater watershed and additional impounding facilities. Since no new watersheds of importance are available, the only possibility of an increased supply lies in providing sufficient additional impounding capacity to store excess wet season inflow for times of dry-season yield. Obviously, Gatun Lake cannot be counted upon to any great degree for this purpose, since the locks are constructed for a maximum operating level of eighty-seven feet, but a project is under consideration to add some seven billion cubic feet of storage to the lake, principally by building a dam at Alhajuela to provide additional storage capacity.

The operation of spillways is dictated by the rise in level of Gatun Lake. Since this is carefully measured and since the dis-

[25] Governor. Annual Report, 1924, p. 12.

charge capacity of the spillways is known, the operation of the proper number of spillway gates to maintain the proper lake level is a simple matter. Under flood conditions lock culverts may also be used to care for overflow water,[26] and if the freshet is severe enough it is sometimes necessary to close the locks to traffic.

Channel. The maintenance of an adequate channel involves three main activities, dredging and disposal of soil, removal of obstructions and installation and maintenance of navigation aids. Dredging in the sea-level approach channels and in the lakes is largely a routine process, the real problem, as in the past, lying in Gaillard Cut.

The excavation accomplished in any one year is not a criterion for determining average excavation required in the various portions of the canal prism or harbors, because it is not necessary, nor is it economical, to remove accumulations of material every year. It may be stated in general, however, that some 40 per cent of the total channel and harbor dredging is the normal work of silt removal, 5 per cent the production of sand and gravel, and 55 per cent slide removal and channel improvements combined.[27] The channel improvements are undertaken primarily to engage digging equipment profitably and constructively while it awaits call to an emergency, that is, a major slide. In other words, "The Canal" now maintains approximately twice the dredging equipment and personnel and operates twice as long as would be necessary were the slides permanently at rest.

To care for this dredging program considerable equipment is required, that in use, for instance, during the fiscal year 1925, including:

Three fifteen-yard dipper dredges
Two twenty-inch suction dredges
One sea-going suction dredge, and three in reserve
One ladder dredge in reserve
One hydraulic grader
One drill boat
One crane boat
Two 250-ton floating cranes
Five large tug boats, one in reserve
Two small tug boats

[26] During the flood of October 22, 23, and 24, 1923, both side wall culverts at Gatun were so used for thirty-four hours.

[27] Usually divided 40 per cent slides and 15 per cent channel improvement.

Thirteen launches, three in reserve
One twenty-inch relay pump barge
Nine 1000-yard dump scows
Two 2000-yard dump scows
Eighteen miscellaneous water, oil and sand barges
One compressor barge
Two floating barge repair stations

That this equipment is needed, is indicated not only by the fact that over 3,500,000 cubic yards of material were removed from Gaillard Cut during 1924, but also by the number of places at which breaks occurred. Slides of importance were recorded at Cartagena, South Cucaracha, Cucaracha Signal Station, East Culebra, West Culebra, West Lirio and East Lirio. In addition miscellaneous breaks involving 30,000 cubic yards of material occurred. Moreover, in spite of the removal of over 5,000,000 cubic yards of earth and rock in 1925 the material remaining to be removed was estimated at 3,500,000 cubic yards.

In addition to the major dredging, numerous minor operations are carried on which contribute directly to the maintenance of proper channel by controlling slide areas, diverting streams and draining. A typical year's operation is shown by a statement of the miscellaneous projects carried on in 1924. At Lirio Lagoon and vicinity 1800 lineal feet of ditching were dug involving 3782 cubic yards of material; material to the extent of 26,985 cubic yards was placed in fills or moved in slope work; 9000 cubic yards of material were handled in culvert construction; 1075 lineal feet of diversion drainage were completed and 12.5 acres drained. At East Culebra slide 114,200 cubic yards were moved and .6 of an acre was drained.

In the Obispo Diversion and swamps, La Pita Point, and Culebra-Lirio sewer and drainage projects there were completed respectively 450, 1080 and 1900 lineal feet of ditching, and 1640, 3835 and 2640 cubic yards of material removal, while 4715, 9300 and 56,875 cubic yards of material were, respectively, placed in fills or moved in slope work. In addition at Obispo and Culebra-Lirio 5475 and 6100 lineal feet, respectively, of diversion drainage were completed and 76.5 and 49.5 acres were drained. At La Pita Point seven acres were drained.

Another feature of the dredging program is the continuous observation of conditions. Inspections and reports are made daily on those portions of the slide areas fronting on the canal and on

the entire surface of all slide areas periodically during the year. At similar intervals new breaks are reported and drainage conditions noted, and points on the larger slides, such as East and West Culebra and Cucaracha, South, are observed. Movements of consequence are thus anticipated, giving time for the proper maneuvering of dredging equipment.

The dredging program at the slides includes in addition to the work necessary to remove encroachments upon the channel, constructive projects for widening the bays at the foot of the affected areas and improving the curves and prism of the canal, the latter work being engaged upon primarily to maintain in readiness and upon useful work, equipment which may be needed at any moment to cope with a major break. Slides are increasingly infrequent but until they reach the point of permanent repose, dredging work must continue as an activity which bears more the aspect of a major construction enterprise than a maintenance operation.

Shoaling and slides do not offer the only obstructions to navigation, however, in the fresh waters of the canal. The water hyacinth imposes a difficult problem, since it occurs in two forms, anchored and floating, and if left undisturbed quickly grows into a tangled mass of vegetation which fouls rudders and propellers. A patrol is, therefore, kept in the canal and adjacent waters at Gaillard Cut, Miraflores and Gatun Lakes, and at all dumps, to clear these growths. Over six million plants were destroyed during 1924, either by being pulled up or by spraying. Log booms are maintained at such places as the mouths of the Chilibre, Chagres, and Mandingo Rivers to prevent hyacinths, trees, floating islands, and other obstructions from being washed into the canal by freshets.

Other obstructions occur occasionally because of ships becoming disabled in the canal. Immediate assistance is given in such cases by "The Canal," which has ample facilities available. This wrecking service is maintained in combination with salvage operations which may call "Canal" equipment hundreds of miles to sea. The practice of engaging in salvage work involves a threefold advantage: it provides this service in a region where it would probably not otherwise be available, it increases revenues, and it keeps in active commission and condition experienced crews and special equipment which might otherwise not be readily available.

The third feature included under the heading of maintaining the channel is course and channel marking. The installation of permanent lights and markers is a matter rather of construction than maintenance and is at present practically completed. The equipment includes range lights, markers, buoys, lighted and otherwise, fixed lights, and lighthouses. Lighthouses are situated at Roncador, Serrana Bank, Quita Sueno, Toro Point, East Breakwater, Taboguilla, San José, Bona and Flamenco Islands, Farallon Sucio, Isla Grande, and Punta Mala. Certain of these lights are powerful beacons, visible from sixteen to twenty-eight miles at sea. In the canal proper, eighty-five beacons, seventy-three gas buoys, and eighty-two spar buoys are maintained in addition to 135 lights in Gaillard Cut. Gas, electricity and incandescent oil vapor are used as illuminants.

The activities connected with these stations are the same as those normally conducted by the Lighthouse Service of the Department of Commerce, namely, the inspection, maintenance and repair of the various navigation aids. At the present time coöperative arrangements with the Lighthouse Service are in effect under which the inspection and care of three lights in the Caribbean are carried on for the former organization by "The Panama Canal."[28]

A contingent activity carried on in connection with the lighthouse service but more nearly akin to the "business enterprises" of "The Canal" is the matter of sightseeing tours. Lighthouse Subdivision vessels carry passengers through the canal on sightseeing tours for a small fee. In 1923, 3734 passengers were carried, bringing in receipts of $10,041, while in 1924 the figures were 3718 and $10,275 respectively.

Power Generation. While the generating stations were designed primarily to produce current to operate the locks and light the canal, they also supply electricity for municipal, domestic, and "business" purposes. Power is supplied from two sources, a hydro-electric generating station and a steam-electric plant, which are operated in conjunction or alternately as conditions dictate. The steam-electric plant, however, is reaching the end of its economical life and a new Diesel engine plant is under construction, which will be completed early in 1927.

[28] The U. S. S. "Favorite," lent by the Navy to "The Canal," is used in this service.

The hydro-electric station, located at Gatun Dam on the east bank of the spillway discharge channel, utilizes water from Gatun Lake to actuate the turbo-generators. The capacity of the station is 13,140 kilowatts, with provision for future extension to 22,140[20] kilowatts. The steam plant at Miraflores is used, as a rule, only to relieve the Gatun Station during the dry season or in case of accident.

Power may be transmitted from either the hydro or steam station by a two-circuit, 44,000-volt transmission line, which parallels the Panama Railroad across the Isthmus. This line transmits power to various substations, where it is "stepped down" to suitable distribution voltages as conditions require.

The average combined generator output, in kilowatt hours per month, has been as follows during the past five years:

1921.....	5,958,660	1923.....	4,422,920
1922.....	4,856,905	1924.....	4,688,472
	1925.....	5,409,357	

The plants are now operating well within their capacity.

Locks. The maintenance and operation of the canal locks is, perhaps, the most essential and complicated activity of "The Canal." The procedure by which ships are passed through has been outlined in previous pages, but certain details of operation may bear further exposition.

There are two main groups of action involved in the operation of the locks, those concerned with the filling or emptying of the chambers and those with the movement of the various safety devices. The filling and emptying of the chambers, in turn, involves both the control of water flow and the movement of the gates.

Water enters the locks wholly by gravity, no pumping being resorted to at any point. Gatun and Pedro Miguel locks are supplied directly from Gatun Lake, while the Miraflores flight obtains its supply from Miraflores Lake, which, in turn, receives most of its supply from Gatun Lake. Huge concrete tunnels or culverts pierce the lock walls both longitudinally and laterally, opening upward into the floor of the lock chambers. Provision is also made for the flow of water through the central wall from one

[20] That is, with ample water available. The actual annual capacity of the plant is limited by the water supply, and during the dry season the plant is frequently forced to shut down.

chamber to another on the same, or a lower, level.[80] The flow of water through these culverts is regulated by gate or cylindrical valves, depending upon location. These valves are operated by electric motors with remote control; that is, the operation of each valve is controlled from a central switchboard in the tower at each lock. Automatic visual indication of the operation of each valve is provided, so that the operator has before him at all times an exact picture of what is going on.

While safeguards are thrown about practically every phase of the operation, there is still need for judgment on the part of the operator. Certain crests and troughs caused by the over-travel of water passing from one lock to another may cause the gates to be pushed open or a ship to be swung against the walls. The difference in density between fresh and salt water in the lowest locks also causes disturbing currents which may swing a ship out of control. Operators, therefore, must be so trained that they know the exact point at which to shut the valves in relation to the gate closing, the effect of rapid or gradual cross-filling, and the like.

The operation of the gates is simple in principle. Each gate is composed of two leaves, which are made up of steel plates riveted to steel frames. The lower portion of the leaf forms an air tight compartment with a buoyancy slightly less than the weight of the leaf, so that the pintle bearing on the bottom and the yoke bearing at the top of the leaf do little more than form a turning point for the end of the leaf at its junction with the lock wall. When the two leaves are open they stand in recesses in each side wall. When closed they meet in the center of the lock chamber. Each leaf is longer, in a horizontal direction, than the distance from turning point to the center of the chamber; consequently, they meet at a point which is not in line with the turning points. The location of this meeting point is upstream from the line joining the turning points, a distance equal to one-fourth that between the two turning points. In closed position the gates form a three-

[80] The culverts and gates are so arranged that in case of floods and like emergencies water may flow through the culverts from the upper to the lower level. Advantage is taken of this during acute flood stages to supplement inadequate flow over dam-spillways.

LOCKAGES

Type of Lockage	Gatun			Pedro Miguel			Miraflores			All locks		
	North	South	Total	North	South	Total	North	South	Total	North	South	Total
Commercial vessels	2432	2596	5028	2457	2694	5151	2458	2687	5145	7347	7977	15324
Panama R. R. vessels	9	7	16	10	10	20	10	10	20	29	27	56
Launches	2	0	2	2	12	14	3	10	13	7	22	29
Total commercial	2443	2603	5046	2469	2716	5185	2471	2707	5178	7383	8026	15409
Panama Canal	29	21	50	70	124	194	62	93	155	161	238	399
U. S. N. and U. S. A.	87	77	164	92	101	193	94	93	187	273	271	544
Total non-commercial	116	98	214	162	225	387	156	186	342	434	509	943
Grand total	2559	2701	5260	2631	2941	5572	2627	2893	5520	7817	8535	16352
Commercial lockages which included non-commercial vessels	125	146	271	195	128	323	185	152	337	505	426	931

hinged arch, with one hinge in the center of the chamber and one each at the junctions of the two leaves with the walls.

The actuating mechanism of the gate consists of a connecting rod or member fastened near the top and well back toward the hinge of the leaf. The other end of this rod is fastened to a large wheel lying in a horizontal plane and provided with gear-teeth on its circumference. An electric motor, properly geared, engages these teeth, causing the wheel to revolve, either pushing or pulling the connecting rod on the gate, as the case may be, thus moving the leaf. As with the culvert valves all gate mechanisms are centrally controlled, with visual indication of the gate positions always before the operator.

An analysis of the lockages for 1924 showing the type, direction, and frequency of lock operation appears on page 170.

There are numerous auxiliary processes with the necessary machinery for the purpose of safeguarding the primary operations and equipment and of serving in emergency. Strictly speaking, the only apparatus at the locks which may be called an emergency provision rather than a safeguard to operation, is the emergency dam. These dams, located in pairs at the upper end of each flight of locks, are designed for use in case of gate breakage or failure which would permit water to rush through the locks damaging them or draining the lake.

The emergency dams consist of a bridge-like supporting structure, which rotates and swings across the lock channel. After the bridge is swung into position girders are dropped so as to engage in slots in a concrete underwater sill. The girders are thus in a vertical position, in a row across the channel. Plates, sliding on these girders, are then let down successively until each section is filled, thus forming a complete barrier against the water. The dams are electrically operated, but locally—not from a central point. They are thrown into use periodically in order to test the machinery and to train the force.[21]

Safeguarding appliances are numerous and varied, consisting of those designed principally to prevent damage to canal struc-

[21] It was originally intended to use these dams also when it was necessary to unwater the locks for maintenance or repairs, but the leakage, while not sufficient to impair the usefulness of the dams as emergency barriers, was too great to permit of the former use.

tures, but in part to avoid injury to ships. Beginning at the point of ultimate control, the first of these is the interlocking switchboard, the operation of which is an ingenious application of a principle which has long been used in railroad signal work. The purpose of the interlocking is to preclude an improper sequence of operations, preventing, for instance, the opening of valves for the ingress or egress of water in a chamber while gates are open or in motion, or the opening of the gates before the water has reached a proper level. While these actions are almost wholly automatic, a sufficient number of selective operations are left to the operator's discretion, so that he may vary the sequences within the range of safety when desirable.

The electric towing locomotives serve to safeguard lock structures against damage by ships and also to protect the ship against injury from striking against the lock walls. These "electric mules" run upon tracks bordering the lock chambers, and by a combination of electric drum or winch and variation in their own tractive-effort control the tow lines to vessels.

A third protective measure included under the operating activities at the locks is the guard gates, which are duplicates of the lock chamber gates and are operated in the same manner. They are placed a short distance from the main gates and serve as a barrier to the water in case the other gates should be disabled. While from this aspect they comprise an emergency measure, they are used at each lockage as a part of the safeguarding routine and are also utilized in the short chamber lockages.

The fender chains constitute a final protective device. They are huge chains which stretch across the locks before the gates, protecting the latter from ramming by a ship out of control. The end of the chain pays out from a device which offers hydraulic resistance to any pressure on the chain, thus gradually stopping a vessel which presses against the chain. The stoppage is not sudden enough either to damage the bow of the vessel or to break the chain. The chain is raised and lowered electrically, and when not in use rests upon the bottom of the lock where it will not interfere with the passage of ships.

Maintenance and repair work has to be carried on at the locks periodically. Each lock chamber is unwatered and inspected and the necessary repairs made once every four years. In order to seal

the locks against the head of water a floating caisson is used in all unwatering instead of the emergency dams as had been originally contemplated. Paint and materials in the locks are subjected to unusually severe conditions. In the lower chambers surfaces are exposed to both salt and fresh water, while above water, heat, high humidity, and salt air play their part. Tropical ants and the teredo take their toll of materials. Rust and corrosion are rapid and severe, and to these special conditions must be added the unusual wear of moving parts because of the difficulty of lubrication under water.

All submerged surfaces are painted at times of overhaul with bitumastic enamel and worn parts are replaced. Electrical conduits and insulation are inspected and renewed where insects, electrolysis, or corrosion have rendered it necessary. Rivets, bolts, and screws are replaced where worn out, as are links in the fender chains. Other phases of the maintenance and repair activities concern equipment which is not exposed to the action of water, and they differ in no essential from the ordinary procedure in a plant using electrical machinery. Towing locomotives, illumination system, motors, winches, pumps, etc., offer no unusual problems.

The only lock out of commission in 1925 was Miraflores, which had one chamber or another out of use for fifty-nine days during the periodical overhaul.

Business Enterprises. The business enterprises of "The Canal" involve a group of activities highly organized and important in themselves, but functionally secondary to the work of putting ships through the waterway. Most of these activities have been developed to supply to transiting or calling vessels, service of the most complete type. A few of them, such as the commissary, were established for the benefit of employees.

The Panama Railroad. The Panama Railroad unlike the other business enterprises of "The Canal" was neither created to afford conveniences to shipping nor to serve "The Canal" employees. It was completed in 1855, thus antedating the canal by almost sixty years and the first transcontinental railroad in the United States by about fourteen years. It served as an essential factor in the construction of the canal and remains a valuable adjunct to its operation.

Transportation. The prime activity of the Panama Railroad is the transportation of freight and passengers across the Isthmus. The railroad extends from Colon to Panama, a distance of 47.61 miles, on the east of the canal. The route follows in general the shore of Limon Bay and the canal from Colon to Gatun, at which point it swings east around the shore of the lake until some five miles from the canal axis. At this point the line swings southeasterly, crossing the lake on fill for a distance of about five miles. Reaching the mainland, the line follows the lake shore and canal channel until Gaillard Cut is approached, at which point the railroad diverges, running back of the hills away from the slide area, and rejoining the canal at Paraiso. From this point it parallels the canal, gradually swinging off through Balboa into Panama.

The Panama Railroad now consists of a single-track main line of five-foot gauge, laid with ninety-pound rails on rock ballast and equipped with automatic signals. The rolling stock is reasonably modern, though necessarily light, and includes oil-burning locomotives.[32]

The passenger service includes local and through traffic, but of late years few persons have used the railroad as a means of crossing the Isthmus to make connections between vessels not transiting the canal. The total number of passengers carried in 1925 was 455,266, 163,688 first class and 291,578 second class. General passenger statistics for 1925 were as follows:

Gross revenue (inc. baggage express, mail and treasure)	$500,879.47
Passenger train mileage (including mixed trains)	105,259
Passenger trains per day per mile of road	6.06
Coach mileage	574,083
Baggage, express and mail car mileage	173,907
Passengers carried	455,266
Passengers carried 1 mile	16,232,472
Average distance each passenger carried	35.65 mi.
Passengers in each train	154.21
Passengers in each passenger car (excluding baggage, etc.)	28.28
Revenue per passenger train mile	$4.76
Revenue per passenger car mile (including baggage, etc.)	$0.6696
Cars in each passenger train (including baggage, etc.)	7.11
Revenue per passenger	$0.864
Revenue per passenger per mile	$0.0242
Passengers 1 mile per mile of road	340,947
Revenue per mile of road	$10,520.47

[32] A list of the rolling stock is given in Appendix 6.

The revenue from passenger transportation during the year 1925 was as follows:

Passenger	$393,506.49
Baggage	1,626.15
Express mail, etc.	49,066.75
Parlor and chair car	8,217.25
Special service train	19,101.00
Panama—Paraiso motor cars	11,951.16
Operations official motor cars	13,531.94
Total	$497,000.74

Obviously much of the passenger traffic is in connection with "Panama Canal" affairs, and can be considered "business enterprise" revenue for accounting purposes only.

The freight traffic includes both through shipments and local shipments, as well as commercial and non-commercial freight, and was as follows in 1925 (in tons):

Commercial:	
Through	54,337
Local	72,938
Non-Commercial:	
Army	14,407
Panama Canal	64,073
Commissary	34,747
Company	1,673
Total	242,175

Service is afforded by the railroad in transferring freight across the Isthmus from Atlantic to Pacific carriers, and *vice versa* on a basis of through routing. This constitutes, in effect, competition with the canal, but is of no marked volume.

The revenue derived from freight transportation in 1925 was as follows:

Through commercial	$215,601.78
Local commercial	576,118.13
Total	$791,719.91

General freight revenue statistics for the same year are as follows:

Gross revenue	$791,719.91
Revenue per freight car mile	0.60
Revenue per freight train mile	10.81
Revenue per ton of revenue freight	3.29
Revenue per ton per mile	0.0948
Freight revenue per mile of road	16,629.28

A similar analysis of traffic shows the following:

Freight train mileage (including mixed trains)	73,265
Freight trains, per day per mile of road	4.22
Loaded freight car mileage	935,900
Empty freight car mileage	299,305
Caboose mileage	75,965
Total freight car mileage (including caboose)	1,311,170
Percentage of loaded car mileage to total car mileage (including caboose)	71.38
Loaded freight cars per train	12.77
Empty freight cars per train	4.09
Loaded and empty freight cars per train	16.86
Tons through commercial freight carried one mile	2,606,406
Tons local commercial freight carried one mile	2,167,878
Tons local Army freight carried one mile	513,758
Tons local Panama Canal freight carried one mile	2,224,496
Tons local Commissary freight carried one mile	1,238,155
Tons Company freight carried one mile	57,890
Tons revenue and company freight carried one mile	8,808,583
Tons in each loaded car	9.41
Tons in each loaded and empty car	7.13
Tons in each train	120.23
Average miles each ton of revenue freight carried	36.38
Tons revenue freight carried one mile per mile of road	183,799
Revenue freight engine mileage	73,265
Tons handled per revenue freight engine	120.23

A third source of direct transportation revenue is to be noted, namely, the switching service and locomotive service to private concerns and organizations other than the railroad.

These activities in 1925 brought in the following revenue:

Switching service	$38,155.15
Locomotive service	122,360.85
Total	$160,516.00

The total direct revenue from transportation, thus, was as follows:

Freight	$791,719.91
Passenger	497,000.74
Miscellaneous service	160,516.00
Total	$1,449,236.65

While the above activities cover, in general, those concerned with revenue in the field of railroad operations, they are necessarily accompanied by the maintenance, repair, and replacement

operations usual to a railroad. Maintenance of way and structures on the Panama Railroad presents no unusual features.[33] Maintenance and repair of equipment, however, is carried on in the mechanical shops of "The Panama Canal" and is not a direct activity of the railroad.

Direct railroad operating expenses involved in the above activities in 1925 were as follows:

Maintenance of way and structures	$135,298.78
Maintenance of equipment	382,414.22
Traffic expenses	5,312.88
Transportation expenses	578,005.40
General expenses—Isthmus	103,041.28
Locomotive service to outsiders	122,360.85
Total	$1,326,433.41

A number of other minor activities are included under direct railroad operations, although they are not connected directly with transportation. These activities, with the revenue produced by them in 1925, follow:

Storage:	
Freight	$9,858.83
Baggage	136.15
Demurrage	18,306.75
Telegraph	2,314.96
Rent of buildings used in operations	2,585.12
Miscellaneous	26,063.23
Total	$59,265.04

The above total added to that for direct transportation revenue gives a gross railroad operation revenue for 1925 of $1,508,501.69, and makes the net revenue from railroad operation $182,068.28.

Non-Transportation Operations. The indirect or auxiliary activities of the Panama Railroad involve the operation of the Atlantic and Pacific harbor terminals, the coaling plants, the commissary, and numerous other enterprises of lesser importance, some of which are more or less arbitrarily classed as independent.

Harbor Terminals. Harbor terminals are located at Cristobal and Balboa. At the former point there are three piers 1300 by 200 feet, supporting enclosed sheds 945 by 165 feet. In addition, at Cristobal Point there are two wharves joining at an angle, with

[33] Except that the railway signal system is under the jurisdiction of the Electrical Division of "The Panama Canal."

a total length of 1500 feet and a width of 100 feet. These terminals, of steel and concrete, are bordered by channels of forty-one foot depth, mean tide. Balboa possesses one pier 1000 feet in length and 201 feet wide, also of steel and concrete.

The work carried on at these terminals consists of loading, discharging and interchanging cargoes, and of stevedoring, handling, and transferring freight, affording wharfage and storing goods.

The Superintendent of Harbor Terminals acts as agent for various outside steamship lines which have no established agencies on the Isthmus. General statistics for 1925 follow:

Tons of cargo stevedored	327,237
Revenue per ton stevedored	$0.3504
Cost per ton stevedored	$0.2345
Tons of cargo handled and transferred	994,245
Revenue per ton handled	$0.9630
Cost per ton handled	$0.6812
Gross operating revenue	$1,233,984.77
Gross operating expense	$913,242.01
Net revenue	$320,742.76
Per cent of expense to gross revenue	74.01

In 1925, 2227 ships were handled; 720 at Balboa and 1507 at Cristobal. In addition agency service was furnished to 488 ships transiting the canal at a fee of $25 per ship. Tons of general cargo received amounted to 581,575, of which 503,793 were at the Atlantic terminal and 77,782 at Balboa. The former point dispatched 365,744 tons of cargo and the latter 23,892 tons, a total of 389,636 tons. The revenue from harbor terminals in 1925 was as follows:

	Balboa	Cristobal	Total
Wharfage	.....	$115,355.58	$115,355.58
Rent of wharves or space on wharves and storage	$1,295.44	15,546.44	16,841.88
Stevedoring revenue	15,047.05	99,606.85	114,653.90
Freight handling and transfer revenue	111,174.77	846,234.42	957,409.19
Miscellaneous harbor terminal revenue	9,971.23	19,752.99	29,724.22
Total	$137,488.49	$1,096,496.28	$1,233,984.77

Maintenance, repairs, and replacements on the terminals are of the type normally carried on in connection with steel and concrete marine structures. Replacement of piling, necessary dredging, and painting, generally speaking, cover the activities.

The expenses of harbor terminal operations in 1925 show the following items:

	Balboa	Cristobal	Total
Stevedoring	$5,694.22	$54,802.19	$60,496.41
Freight handling and transferring	76,013.59	455,227.97	531,241.56
General harbor terminal expenses	18,270.72	303,233.32	321,504.04
Total	$99,978.53	$813,263.48	$913,242.01

Net harbor terminal revenues for the year show a total of $320,742.76.

Coaling Plants. The coaling plants of the Panama Railroad at Cristobal and Balboa constitute important non-transportation activities. These plants handle all coal consumed, stored, or purchased in the Canal Zone, and represent a combined capacity of 700,000 tons; 500,000 at Cristobal and 200,000 at Balboa. A certain proportion of this tonnage is in underwater storage at Cristobal. The plants are equipped with modern and efficient handling machinery, and are capable of bunkering ships at from 100 to 500 tons per hour.[24] Coal is brought from Norfolk by arrangement with a private steamship line, which heretofore had been returning vessels in ballast to Chile. Coal is also stored for the Navy Department, although such coal is purchased and transported by the Navy and not by the Railroad Company.

The quantity, in tons, of coal disposed of on the Isthmus in 1925 was as follows:

Panama Railroad:	
Engines	[a]16,940
Other purposes	130
Steamship Lines:	
Panama Railroad	152
Other—Atlantic terminal	279,914
Pacific terminal	1,917
United States Army	6,047
United States Navy	46,000
The Panama Canal	2,990
Miscellaneous	3,816
Total	357,906

[a] Equivalent in tons of coal, of oil consumed. Oil thus included amounted to 67,760 barrels.

[24] Cargo loading figures are naturally in excess of bunkering. The plants are capable, for instance, of giving a collier cargo coal at the rate of 2000 tons per hour.

The financial experience of the coaling plants, during 1925, was as follows:

Receipts from sales, including charges for handling, unloading, storing and delivering Navy coal	$2,968,113.50
Handling costs, including depreciation	2,458,005.23
Net return	$510,108.27

Telephones. The telephone and electric clock system, while owned by the Panama Railroad, is operated and maintained by the Electrical Division of "The Panama Canal." The revenue experience in 1925 was as follows:

Revenue	$210,407.47
Expenses	206,723.21
Net revenue	$3,684.26

Stables. The railroad operates stables at Colon, the receipts from which were $20.498.90 in 1925, with attendant expenses of $19,511.60, leaving a net revenue of $987.30 for the year.

Baggage Transfer. A baggage transfer system in Colon and Panama is also operated by the railroad. This system in 1925 produced a net revenue of $2,568.01 from receipts of $14,906.23 and expenses of $12,338.22.

Commissary System. The commissary system of the Panama Railroad includes a number of interests varied in character but similar in purpose, namely, to supply food to residents and visitors in the Canal Zone. To carry out this activity a considerable investment in plant and equipment is required. At present it is as follows:

Plants and stores	$2,084,985.88
Equipment	113,293.23
Supplies on hand	1,401,376.69
Floating capital	500,000.00
Total	$4,099,655.80

The operating plants consist of five wholesale units, twelve retail stores and ten manufacturing plants in addition to six service plants and two refrigerating plants. The manufacturing plants include canneries, a meat packing plant, and an industrial laboratory. The retail establishments, conducted as "department" or "general" stores, sell directly to "Canal" employees and to Army and Navy personnel. Coupon books are issued on three

bases: payroll deduction, cash, or credit, and at five different prices. Goods are sold approximately at cost, plus expense of handling.

The gross receipts from sales in 1925 were $7,944,101.65, and the supplies on hand amounted in value to $1,401,376.69. The goods purchased were as follows in value:

Groceries	$1,351,059.33
Hardware	586,436.39
Dry goods	1,134,196.45
Shoes	245,272.02
Cold storage	1,250,231.94
Tobacco	412,567.67
Cattle and hogs	473,229.49
Milk and cream	98,027.88
Eggs	249,398.85
Butter	230,415.72
Raw material	303,878.64
Total	$6,334,714.38

Gross sales receipts were distributed among the following purchasers:

United States Government	$1,062,589.02
"Panama Canal"	743,594.24
Steamships	604,656.09
Panama R. R. and Steamship Co.	249,774.64
Individuals and companies	731,675.58
Employees	4,909,983.00
Total	$8,302,272.57

Discounts and credits amounted to $358,170.92, leaving gross revenue from sales, $7,944,101.65. The net profits for the year 1925 were $392,070.48.

Cattle Raising. Closely allied to the commissary system and supplying much of its food are the farm industries under railroad jurisdiction. These consist of the cattle industry, a dairy farm, and the plantations.

The cattle industry consists of a stock farm devoted to the breeding and raising of beef cattle. Cattle are sold on the hoof to the commissary system, the dairy farm,[35] or to outside companies or individuals. Revenue is also derived from the sale of hides and other products, such revenue accruing to the Com-

[35] Sales to commissary or dairy farm are more accurately described as transfers since the transaction is an accounting matter only.

missary Division. The cattle industry is closely connected with the abattoir and meat packing plant of the commissary system.

There are forty thousand acres of pasture land devoted to grazing for the cattle industry. The principal work of maintenance in connection with the industry is the clearing and reclearing of pasture land, that is, "keeping the jungle out." During 1925, 5987 acres were recleared at an expense of $17,661.65, but no new clearing was performed. Repairs to buildings and other structures are under the jurisdiction of the Constructing Quartermaster of the "Panama Canal."

The volume of cattle business in 1925 is indicated by the following figures:

On hand June 30, 1924	4,260
Purchased during the year	12,548
Born during the year	284
Delivered to Commissary for slaughter	7,461
Transferred to dairy farm	230
Transferred to pastures	10
Sold to outsiders	40
Died	1,266
On hand June 30, 1925	8,105

The financial results accompanying this turnover were as follows:

Sales to Commissary and outsiders	$479,891.75	
Sales of hides and other products	2,319.49	
		$482,211.24
Operating expenses		465,239.77
Profit from operations		$16,071.47

Dairy Farm. The dairy farm produces milk for direct consumption and for butter making on the Isthmus. In addition a few head of cattle are sold annually and miscellaneous products, such as hides, bring in a small revenue.

The general experience of this farm during 1925 follows:

Cattle on hand June 30, 1924	663
Purchased	75
Born during the year	31
Received from Cattle Industry	230
Delivered to commissary for slaughter	306
Sold to individuals and companies	10
Transferred to Cattle Industry	10
Died	44
Head on hand June 30, 1925	629

Income from sales of milk, livestock, hides, etc., amounted to $59,150.99 in 1925. Expenses of operation were $60,577.77, leaving a net loss of $1,436.78.

Plantations. A plantation is operated at Juan Mina by the Panama Railroad under the superintendence of the cattle industry. This plantation raises citrus fruits: oranges, grape fruit, lemons and limes. Operating revenue in 1925 was $9,362.29, and expenses $11,427.02, resulting in a net loss of $2,064.73.

Smaller plantations and gardens are granted on license or lease to individuals for development. Licensees are charged $5 per hectare of land leased per annum, with a maximum allotment to individuals of fifty hectares. A plantation must be occupied and improved by the licensee within six months of the granting of a license or the grant is withdrawn. The purpose of these leases, however, so far as "The Panama Canal" is concerned, is neither the raising of any particular crop nor the production of income. It is rather to hold close at hand a potential and available labor supply for emergencies. Laborers who have been released by "The Canal" can thus raise sufficient food to keep them in reasonable comfort.

Plant Introduction Gardens. The plant introduction gardens at Summit combine the functions of nursery, botanical garden, and experimental station. Seeds and plants of local flora are collected for propagating purposes, including the planting of seeds for stock plants of mangos, avocados, and citrus fruits, while seeds and plants are distributed to residents of the Canal Zone. The plants distributed include ornamental shrubbery, flowers, trees, and fruits, and vegetable seeds are given to farmers of the Zone. Trees are set out from time to time in accordance with a limited reforestration program; consultation and advice are offered to persons seeking information on plant growth problems; lectures and practical demonstrations are given to school groups and individuals visiting the gardens; and budding and pruning service is given to farmers.

Experimental cultivation of a wide variety of plants is carried on with a view to local introduction. The experimental plantings include the fiber plants, such as hemp and rubber; fruits, such as

citrus, mangos, avocados, pineapples, papayas, and bananas; forage crops of drought-resisting qualities; green crops, including rice; leguminous cover crops; trees; and medicinal, drug, and beverage plants and vegetables. These operations are obviously closely related to the plantation and food-supply problems on the Isthmus.

Hotels. Closely connected with the commissary system are the hotels: the Tivoli in Ancon and the Washington in Colon. The former is operated by "The Panama Canal," while the latter is conducted by the railroad. The Washington contains eighty-eight rooms and has adopted the European Plan, with rates ranging from $4 to $10 per day. The operating revenue for the Hotel Washington for the fiscal year 1925 was $191,245.48 and the expenses, including depreciation of building, $196,442.46, leaving a net loss of $5,196.98.

Numerous restaurants exist, but they are operated under private concession.[36]

Real Estate Operations. Real estate operations of "The Canal" and the railroad are handled by a joint land office, the expense of which is borne by the railroad, a charge being made against "The Canal" for services rendered. This office supervises the leasing and rentals of railroad lands in the cities of Panama and Colon and public lands in the Canal Zone. The real estate operations of the railroad in 1925 produced a revenue of $163,189.15, which with expenses including depreciation of $59,955.25 left a net return of $103,233.90. At the close of this fiscal year 1265 leases and revocable licenses had been granted by the railroad for use of its property in the cities of Colon and Panama, in addition to 2112 licenses in force covering 7111 hectares of agricultural land.

The Panama Railroad Steamship Line. The Panama Railroad Steamship Line, because of corporate identity might be included among the business enterprises conducted by the railroad, but its operations are of sufficient importance to warrant separate classification. It operates between New York and Cristobal on what

[36] These are at Cristobal, Gatun, Pedro Miguel, Balboa, and Ancon. They are primarily for government employees but are open to the public.

is approximately a weekly schedule. Three steel steamships are employed in this service, the "Ancon" and the "Cristobal," each of 9606 gross tons, and the "Panama" of 5667 gross tons. The "General O. H. Ernst" and the "General W. C. Gorgas," steel steamships for freight and passenger service, of 2564 and 4689 gross tons, respectively, are held in reserve. The "Lake Flattery," a steel passenger and cargo vessel with a gross tonnage of 2609, is employed in a general tramp service to the west coast of Central and South America and elsewhere.

The steamship line was a vital factor in the construction of the canal and still remains a valuable adjunct. All government supplies and passengers are carried at approximately cost, which is considerably below the general commercial rates. In spite of this the line pays all charges and normal overhead expenses, except insurance, which it is prohibited from carrying by law.[87] The result is a loss on operations at the present time, but the line serves the interests of "The Canal" and helps to keep prices on the Isthmus at a minimum, in addition to serving as a bulwark against foreign control of the West Indian trade.

Steamship operations in 1925 showed a gross revenue of $2,255,541.15 and gross expenses of $2,197,821.69, leaving a net operating income of $57,719.46.

The result of all operations was a deficit:

Revenue from Operations		Operating Expenses	
Source	Amount	Item	Amount
Freight	$1,507,787.66	Steamer expenses	$1,602,089.11
Passenger	347,188.00	Agency expenses	404,873.39
Excess baggage	2,335.91	General expenses—N. Y.	177,373.11
Mail	84,219.26		
Treasure	6,347.36		
Mineral waters, etc.	1,174.58		
Steamer chair service	5,381.00		
Miscellaneous	31,333.84		
Total	$1,985,767.61		
Deficit	198,568.00		
	$2,184,335.61		$2,184,335.61

[87] 36 Stat. L., 1363, 1451.

Steamship traffic statistics for 1925 were as follows:

Item	No. of ships	Freight tonnage carried	No. of ships	Passengers carried
Panama Railroad Ships:				
Arrived	16	33,622	16	1,686
Sailed	17	44,173	17	945
Chartered Passenger Ships:				
Arrived	26	53,228	26	3,246
Sailed	28	90,976	28	3,113
Total	87	221,999	87	8,990
Total freight revenue		$1,507,787.66		.....
Average rate per ton		6.79		.....
Total passenger revenue (including excess baggage)		.....		$349,523.91
Average rate per passenger		.....		38.88

Salvage Work. The salvaging service of "The Panama Canal," though originating as an offshoot of the maintenance work in keeping a clear channel, has become a small business enterprise in itself. A wrecking tug, the "Favorite," fully equipped for all salvage work, is stationed in Gatun Lake ready to answer calls from either ocean with equal facility. In addition to this vessel two ocean-going tugs, one at Balboa and the other at Cristobal, are available and equipped for towing. A skeleton crew of experienced salvors is employed, supplemented if occasion demands by employees drawn from other phases of "Canal" work.

The arrangements under which salvage operations are undertaken by "The Canal" are as follows:

> The Panama Canal will undertake salvage operations either on a per diem basis for the use of the equipment, a fixed price for the job with graduated reimbursement in case of failure or partial success, or on the basis of "no cure, no pay." The salvage section is maintained for service rather than for revenue, and whatever form of contract owners or underwriters may prefer the efforts of the wrecking crew will be to do quick and efficient work consistent with the canal's reputation.[28]

Mechanical Shops. The mechanical shops of "The Panama Canal" form an important unit of the business enterprises on the Isthmus. The shops are maintained for the dual purpose, of performing repairs and replacements on "Canal" equipment and plant and of rendering service to general shipping.

[28] Governor, Annual Report, 1922, p. 13.

The major portion of the work is on marine equipment, while service for the Panama Railroad, manufacture for stock, and miscellaneous jobs make up the total. The monetary value of mechanical work done in the shops in 1925, by type and the percentage of each type of work, was as follows:

Class	Amount	Percentage of total
Marine	$2,245,522.56	62.03
Railroad	526,149.75	14.53
Miscellaneous	531,758.96	14.69
Manufacture for stock	316,787.36	8.75
Total	$3,620,218.63	100.00

An analysis of the same total according to organizations for whom the work was done shows the value and proportion of the services as they concern various enterprises.

"Panama Canal"	$1,481,476.19	40.86
Panama Railroad Company	516,156.08	14.28
Other departments of the government	392,717.99	10.87
Individuals and companies including steamship line	1,229,868.37	33.99
Total	$3,620,218.63	100.00

The shops are completely equipped for all manner of light or heavy repair work, marine, car, or locomotive, and include foundries. The buildings at Balboa, the principal shops, lie alongside the large dry dock, which is 1000 feet long, 110 feet wide and has a depth over keel-blocks of forty-three feet at normal high tide. This enables it to handle any ship afloat or building. Beyond the shops are repair wharves 3500 feet in length. Repair shops on a smaller scale but capable of handling all ordinary marine voyage repairs, are operated at Cristobal. These shops adjoin the smaller dry dock, which is 300 feet long and fifty feet wide.

The shops are admittedly of considerably larger capacity than present business demands. They are designed for the maximum load with the possibility of war in mind. As a consequence, financial results, because of the excessive plant for ordinary load, are not so favorable as they would be had the shops been designed with probable business volume alone in mind. The necessity for repair and dry docking service is not questioned, however, both as an adjunct to proper operation of the waterway and because

of the fact that the nearest facilities of a similar nature are over 1800 miles distant.

The work done for the various interests concerned, such as "The Canal," the railroad, other government agencies and commercial organizations, varies little in essentials. Work for the railroad is a variation, as it consists of repairs and replacements on locomotives and cars. The rest of the service, however, is on marine equipment, and includes such matters as dry docking, scraping, painting, patching, riveting, machining, welding, forging, and installing new equipment. Certain new construction is undertaken when conditions demand, such as assembling or building electric towing locomotives, passenger cars, and gasoline motor cars.

Much of the marine work requires the dry docking of vessels. The number of vessels docked in 1925 was as follows:

Location	Canal equipment	Other equipment	Total
Balboa dry dock	24	47	71
Cristobal dry dock	19	50	69
Both docks	43	97	140

The mechanical shops in 1925 earned net profits of $87,054.37, while reserves were increased $152,791.67.

Fuel. Although coaling plants on the Isthmus are conducted by the railroad, liquid fuel, including Diesel oil, fuel oil, and gasoline, comes under the jurisdiction of "The Panama Canal." The sale, distribution, and storage of oil, unlike coal, is not a "Canal" monopoly, and private companies are operating in this field.

More fuel oil is sold by "The Canal" than any other commodity, the principal income being derived not from sales, however, but from pumping. "The Canal" maintains central oil pumping stations at each terminal and handles oil in and out of storage. The oil pumped for all interests in 1925 totalled 11,142,357 barrels, while the net revenue from this business amounted to $116,979.61. This was made up as follows:

	Revenue	Expense	Profit
Handling fuel oil	$448,776.28	$360,573.63	$88,202.65
Fuel oil sales	470,175.91	450,998.95	19,176.96
Tank rentals	9,600.00	.....	9,600.00
Total	$928,552.19	$811,572.58	$116,979.61

The basic pumping rate for fuel going into tanks and from tanks to vessels is four cents per barrel per pumping, amounting thus to eight cents a barrel for all oil handled on the Isthmus. "The Canal" at present is not in competition with oil companies, prices being so fixed as to eliminate such competition with companies which have tanks on the Isthmus and carry supplies of oil for sale to transiting vessels.

The sales of liquid fuel for the year 1925 to steamships were as follows:

Item	"Panama Canal"			Private companies			Total		Grand Total
	Balboa	Cristobal	Total	Balboa	Cristobal	Total	Balboa	Cristobal	
Fuel oil sold (bbls.)	3,061	1,666	4,727	1,785,259	3,037,567	4,822,826	1,788,320	3,039,233	4,827,553
Number of ships	3	3	6	639	963	1,602	642	966	1,608
Bulk gasoline sold (bbls.)	....	1,569	1,569	.....	.....	.....	.....	1,569	1,569
Number of ships	....	1	1	.....	.....	.....	.....	1	1
Diesel oil sold (bbls.)	....	3,431	3,431	266,070	1,662	267,732	266,070	4,093	271,163
Number of ships	....	66	66	117	5	122	117	71	188

Storehouse Operations. "The Panama Canal" maintains a system of selling and distributing ship chandlery and other supplies through the medium of storehouses. One, at Balboa, is conducted as a general distribution center for supplying the other storehouses, and in addition has incorporated with it, the medical storehouse. The other storehouses are located at Cristobal and Paraiso, the latter being stocked principally with dredging supplies.

Materials are sold or issued to various agencies including "The Canal," the Railroad, Army, Navy, other government departments, and private purchasers. In addition to the sale and issuance of new materials and supplies, the storehouses handle and dispose of scrap material and obsolete equipment and care for unused equipment relegated to storage. On material issued to departments and divisions of "The Canal" and to others entitled to "Panama Canal" rates a surcharge of 10 per cent is added to cover purchase, handling, and storage expense. On sales to outsiders 25 per cent is added.

The value of stock handled in 1925 was as follows:

On hand June 30, 1924	$3,419,674.34
Received during the year	6,357,100.36
Total	$9,776,774.70
Issued during the year	6,003,285.40
On hand June 30, 1925	$3,773,489.30

The sales of obsolete, surplus, and scrap materials during the same fiscal year brought returns of $61,853.25, while the value of material moved, classified according to user, was as follows:

Local sales	$212,062.90
Sales to steamships	94,898.67
Credit sales	833,058.22
Sales to "Panama Canal" and Panama R. R.	2,262,554.06
Total	$3,402,573.85

The total revenues from storehouses for 1925 were $3,402,573.85, which with deductions of $3,344,623.52 for expenses left a profit from operations of $57,950.33.

Hotels and Restaurants. The Tivoli Hotel at Ancon is operated by "The Panama Canal." It contains 206 rooms, with rates running from $3 to $18 per day, European plan. The restaurants are leased for private operation. The operating revenues for 1925 were $242,033.67 and the expenses $228,348.08, resulting in a profit of $13,685.59.

Building Construction and Repairs. Repair and construction work on buildings is carried on by "The Panama Canal" in various connections; with its own structures and those of the Panama Railroad, and for other government departments or private enterprises on the Isthmus upon request. For "The Canal," the Railroad and the Army and Navy work is done at cost. For other organizations the "cost-plus" plan is used. The work consists of ordinary building and repairs in addition to such matters as grading and filling and the installation of water, sewer, and drainage systems. Building repairs and construction in 1925 showed revenues of $1,046,658.64 and expenses of $1,006,112.63, leaving a profit of $40,546.01.

Printing. The Panama Canal Press operates on a self-sustaining basis maintaining in stock, or manufacturing, stationery re-

quired by "The Canal" for its operations on the Isthmus. It also prints commissary coupon books, the weekly Panama Canal Record, pamphlets, folders, and other miscellaneous jobs. The printing plant in 1925 produced $244,505.34 in revenue, which, offset by expenses of $238,320.54, left a profit of $6,184.80.

Electrical Work. Although the electrical work on the Isthmus as a matter of organization is concentrated in one division, it is variously concerned with the primary "Canal" functions, the business enterprises, and the Zone Government. As has been noted, one phase of the work is the production and transmission of power for the operation of the locks, a primary function. Other phases, such as street lighting, fire-alarms, etc., are closely connected with government administration.

The telephone system in the Canal Zone, though owned by the Railroad, is operated and maintained by "The Panama Canal." No unusual conditions prevail in carrying out this activity, the system being comparable in all respects to any ordinary municipal system in the United States. By January, 1926, the entire system, which included 6650 instruments, was operated automatically. The average number of calls per day of eight hours is 24,186 or 3023 per hour. The system embraces thirty-six miles of pole line, 249 miles of conduit, and 136 miles of cable. A total of 13,744 miles of wire is in use, distributed as follows:

Trunk circuits	4,678
Subscribers circuits	8,626
Telegraph circuits	470

Nine sets of printing telegraph equipment are also in operation in the port captains' offices and at the locks, for use in dispatching ships through the canal.

The Electrical Division of "The Canal" maintains all the automatic signals, train order signals, highway crossing bells and gates, and telegraph apparatus for the Panama Railroad. The work includes the entire service of overhaul, repair, replacement, and installation of new equipment, the supplying of current and charging of batteries, and responsibility for signal failures. In brief, the work is that normally under the jurisdiction of the supervisor of switches and signals on an American railroad.

The maintenance and installation of fire alarms, though basically a governmental service, is here mentioned, since it rounds

out the low-voltage group including telegraph, signals, and telephone. The work is similar to that of telegraph maintenance and offers no unusual conditions.

Installation and maintenance work is done on lighting systems for streets, shops, docks, wharves, public buildings, and residences, and the necessary current is furnished. The activities are those of the ordinary municipal utilities corporation. Power is generated at the Gatun spillway turbine station, with the occasional help of the Miraflores plant. It is properly "stepped down" at various substations to lighting system voltage. The variety of work done in connection with power and lighting systems is wide, including house-wiring, and the installation of fixtures, ducts and cables, pole lines, electric pumping equipment, transformers, switchboards, feeders, and protective devices.

Work is done on vessels of "The Canal," the Railroad, the Navy, other government departments and such commercial vessels as may require it. The type of work aboard ship ranges from rewiring and repair of motor-driven equipment to the delicate operation of calibrating instruments.

Of the total expenditure on electrical work the approximate percentage of distribution in 1925 was as follows:

Work and current for "The Panama Canal"	43
Work and power for the Panama Railroad	35
Work performed for outside interests	10
Work performed and current furnished for other government departments	8
Miscellaneous	4

The general fiscal experience of the electrical work of "The Canal" in 1925 was as follows:

	Revenues	Expense	Profit
Electric light and power system	$756,322.50	$450,826.85	$305,495.65
Electrical work	730,802.96	724,021.04	6,781.92
Telephone, telegraph, and signal	232,983.96	231,108.81	1,875.15
Total	$1,720,109.42	$1,405,956.70	$314,152.72

Rental of Quarters. In addition to Panama Railroad land and building leases and rentals, which are handled through a joint land office, "The Panama Canal" maintains quarters for rental to employees, some being leased to Army personnel and a negligible percentage to outsiders. These quarters are divided into

"gold" and "silver" groups, that is, white and colored. Gold quarters return a profit from operations sufficient to provide an amortization and interest allotment, part of which has been used at times to apply to the erection of additions to quarters. In 1925 the profit amounted to $1,744.65. Silver quarters, on the other hand, show an annual loss on operations. Economic and social reasons demand the proper housing of as many colored employees as possible within the Zone. Rentals, therefore, are fixed on a low scale, and this is taken into consideration in the fixing of silver wages. The loss on operations for these quarters, amounting in 1925 to $88,000, may be considered as additional wage for certain of the colored employees.

Clubs and Playgrounds. The operation of clubs and playgrounds by "The Panama Canal" for employees is a business enterprise in the narrow sense only. Its primary purpose is the welfare of the employee and operations are conducted under a system of subsidy whereby "The Canal" assumes overhead expenses to the amount of $100,000. Excluding this item, an annual profit is usually produced on the income from moving pictures, soda fountains, and the sale of candy, cigars, etc. This profit is deposited in an accumulating surplus fund, which is used for new construction and the purchase of new equipment. Five club houses are maintained for Americans and five for West Indians and, although designed primarily for employees and their families, they are open to transient visitors and the Army and Navy personnel. In connection with the clubs there are athletic fields, tennis courts, swimming pools, and children's playgrounds. In 1925 the revenue including the subsidy from these operations was $581,358.38, and the expenses $498,333.84, leaving a surplus of $83,024.54.

Local Government. The activities concerned with the government of the Canal Zone cover the entire field and include those which in the United States would be exercised variously by municipal, county, state, or federal authority. It is to be expected that the administration of functions normally included under the head of "local government," such as public safety, public works, public health, and public schools, would fall to "The Panama Canal," since the United States Government has no organization concerned with such matters. "Canal" administration extends

beyond this, however, and includes numerous functions which are elsewhere exercised by the federal government. With the exception of the Army and Navy, no federal department administers any activity within the Canal Zone.

Functions elsewhere exercised by various units of the federal government which, on the Isthmus, fall to the administration of "The Panama Canal," include immigration inspection, customs inspection, steam-boat inspection, admeasurement of vessels, shipping commissioner service, lighthouse service, postal service, plant introduction, prohibition enforcement, quarantine, meteorological and hydrographic work, and relations with the Republic of Panama.

Certain of these activities have been discussed in previous pages in connection with aids to navigation and the passage of vessels through the canal. The others remain to be discussed.

Public Health. The preservation of the public health is perhaps the most important single governmental function on the Isthmus. The activities connected therewith involve numerous lines of work, including maritime quarantine, sanitation, child and other hygiene, and clinics and institutional care.

Maritime Quarantine. The purpose of the maritime quarantine, which also applies to aircraft, is to prevent the introduction of cholera, yellow fever, bubonic and pneumonic plague, smallpox, typhus fever, leprosy, influenza, and other diseases which may become a danger to the persons in either the Canal Zone or the Republic of Panama. Preventing the entry of diseases involves the inspection of vessels and the enforcement of regulations and requirements, which include fumigation, rat destruction, etc., and the isolation and treatment of infected persons or carriers. Since these activities are applied to ships approaching the canal for transit, they have previously been dealt with in the paragraphs concerning procedure required before entering the locks.

Sanitation. Sanitation involves a more comprehensive program of work, if not of regulation, than the maritime quarantine necessitates. It includes all of the activities normally carried on by a municipal health department.

Mosquito elimination plays an important part in this program, being directed against the *Anopheles* species, the carrier of malaria, and the *Aedes aegypti,* which transmits yellow fever. The

work consists of the ditching, draining, filling, and oiling of swamps, pools, and other stagnant water, and the destruction of receptacles capable of harboring mosquito larvæ. Where possible the drainage channels are worked into a permanent system of concrete ditches. Fumigation for mosquitoes is no longer necessary except for ships. Fly elimination is also actively carried on. Yellow fever no longer exists on the Isthmus, but the fight against malaria continues. In 1925 1436 cases were reported, divided as follows: employees 180, military and naval personnel 762, and non-employees 494.

Rat elimination for the purpose of preventing bubonic plague consists of inspection, poisoning, trapping, and fumigation.[39] Although this is principally in connection with docking vessels, watchfulness is demanded at wharves and in the older buildings on shore. Trapped rodents are frequently examined to see if they are carrying disease.

Street cleaning and the collection and disposal of sewage, garbage, and refuse are important activities in the sanitation program. They offer no unusual features and are comparable in all respects to similar activities of cities of the United States. Certain of these services, moreover, are not restricted to the Canal Zone but are extended to the cities of Colon and Panama. These include street cleaning, garbage collection, and general sanitation work. In addition sewers, streets and water supply are maintained and constructed for these cities by "The Panama Canal," though the latter activity, strictly speaking, belongs to municipal engineering rather than health protection.

General Preventive Work. General preventive measures, as distinct from what are ordinarily classed under the head of sanitation, include disinfection following communicable disease, vaccination and other immunizing inoculations, child hygiene, and sex hygiene. These activities offer no unusual features. The child hygiene program includes publicity and instruction in regard to the diet and behavior of the expectant mother, the preparation and values of food for infants, child care, and diseases of infancy.

[39] Either sulphur or hydrocyanic gas is used and applied to the destruction not only of rats but also mosquitoes, bed bugs, lice, and fleas, which are variously charged with the transmission of yellow fever, malaria, typhus, and bubonic plague.

The venereal disease clinics offer both curative and prophylactic treatment free of charge, and an educational campaign of information is carried on.

Vaccination and other inoculations are performed at dispensaries and clinics and disinfection of infected premises is carried out where needed.

Institutional Care. The institutions on the Isthmus deal with both mental and physical disease and include general hospitals at Ancon and Colon, five dispensaries,[40] the Corozal farm and asylum for cripples, insane, and miscellaneous chronic cases, and the Palo Seco leper colony. The general hospitals are comparable in all respects to those of American cities and the work performed is the same. The Corozal Hospital conducts a program of occupational therapy, the patients making rugs, toys, and children's furniture, weaving bags, doing block printing and wood carving, and manufacturing brooms. Patients are also employed in farming, laundry work and sewing. Dispensaries give medical and surgical service outside the hospitals, while physicians care for employees and their families and render service to ships passing through the canal. The Palo Seco Leper colony is situated at an isolated point west of the canal on the Bay of Panama, where patients may cultivate their own gardens. Somewhat less than half of the expense of this colony is defrayed by receipts from the Republic of Panama of seventy-five cents per day for each Panaman patient cared for.

A typical year's experience is shown by the figures regarding the patients treated in institutions during 1925:

Institution	Number of patients July 1, 1924		Admitted		Died		Discharged		Transferred		Number remaining June 30, 1925	
	White	Black	White	Black	White	Black	White	Black	White	Black	White	Black
Ancon	183	195	4,342	3,451	65	147	4,248	3,230	32	75	180	194
Colon	20	20	916	1,202	15	51	756	866	153	279	12	26
Corozal:												
Insane	81	294	92	73	5	16	64	52	3	2	101	297
Cripples	2	24	....	4	....	....	....	....	....	....	2	28
Chronics	2	24	3	19	....	2	2	9	....	1	3	31
Palo Seco leper colony	6	86	1	12	1	4	....	5	....	....	6	89
Total	294	643	5,354	4,761	86	220	5,070	4,162	188	357	304	665

[40] Located at Colon, Gatun, Pedro Miguel, Ancon, and Balboa.

General Services. A laboratory for chemical and bacteriological examinations is maintained. Bacteriological and chemical analyses of milk are carried on and examinations of blood films for malaria, eye smears for gonococcus, urine for albumin, and other tests are made. Chemical analyses of beverages, drugs, canned foods, and miscellaneous supplies are performed as well as clinical examinations requiring quantitative determinations. Toxicological tests after death from unknown causes and autopsies and other post mortem duties are carried on.

The fields of local medical, sanitary and economic entomology are covered, especially in relation to mosquitoes. Inspection of mosquito-breeding areas are made and studies of household, forage-crop, vegetable, truck-crop, and tropical fruit tree insects are carried on.

Municipal Engineering. Municipal engineering work on the Isthmus involves those activities normally included in municipal government under the head of public works, namely, the provision and maintenance of water supply, sewers, highways, garbage, and refuse disposal, and the construction of public buildings.

Water Supply. The impounding of the water supply and the provision of new sources is a part of the larger problem of supplying water for the direct operations of "The Panama Canal." The maintenance and operation of pipe lines, reservoirs, filtration plants, and pumping stations fall within the field of local government, however, both as to potable supply and fire protection.

The consumption of water in gallons in 1925 was:

Canal Zone including Army posts	3,140,009,765
Panama	1,117,982,000
Colon	586,325,000
Sold to ships	132,942,685
Total	4,977,259,450

The sources of water supply are as follows: for the Southern District water is drawn from the Chagres River at Gamboa and pumped across the continental divide by a pump station at Gamboa to the filtration plant at Miraflores, from which it is distributed in the Canal Zone and the City of Panama by pumping stations located at Miraflores and Balboa. There is an auxiliary pump station at Miraflores, which can be used for drawing water from

Miraflores Lake in emergencies. Water for the Mount Hope filtration plant is drawn from the Brazos Brook reservoir, which in turn can be replenished from Gatun Lake and distributed by a pump station at the filtration plant to Cristobal and Colon and the Army and Navy posts on the east side of Limon Bay. The Agua Clara filtration plant draws water from Agua Clara reservoir, which is distributed by a pump station at the filtration plant to Gatun, Fort Davis, and Fort Sherman. The Army post at Camp Gaillard, on the west side of the canal, is supplied with unfiltered water from Rio Grande and Camacho reservoirs, distributed by pumping stations at Empire and Cucaracha. Filtered water for drinking and cooking is pumped across from the east side of the canal by a station located at Paraiso. Unfiltered water is used in the villages of Monte Lirio and Frijoles, which have no connection with the main supply system.

At the filtration plants the water is aerated, treated with alum, passed through sedimentation basins and rapid sand filters, and chlorinated. At Agua Clara it is also necessary to treat the water with soda ash and lime.

Water is sold to " The Panama Canal," the Panama Railroad, and the Army and Navy at a rate of twelve cents per thousand gallons. It is supplied to ships at the docks at the rate of fifty cents per thousand gallons. Water rates in the cities of Colon and Panama are twenty-five cents and forty cents per thousand gallons, respectively. The amounts collected in these cities by " The Canal " are applied toward interest on and amortization of the capital investment in water and sewer systems and streets and to the maintenance and further development of these municipal improvements. The higher rate in Colon has produced sufficient income to permit a considerable amount of construction of new streets, but the rate in Panama has not been sufficient to meet the fixed charges and maintenance costs and deficits have occurred, which have been charged against the Republic of Panama.

Considered as a business enterprise and including paid as well as non-revenue producing services, the water system in 1925 showed revenues of $556,017.89 and expenses of $529,379.63, leaving a profit of $26,638.26.

Sewers. Work in connection with sewers consists of maintenance, repair, and necessary construction, although the last is at

present negligible in volume. Flushing is also maintained as a routine process. These services are performed not only in the Canal Zone but also, under agreement, for the cities of Colon and Panama. In the latter locations the expenditures are charged against the Republic of Panama, the revenues derived from water rentals being applied by "The Panama Canal," in part, against such charges.

Highways. The duties involved in highway administration include the construction, maintenance, and repair of streets and roads and also grass cutting along road borders and the clearing of ditches and drains. Services are also rendered to the cities of Colon and Panama. Problems in highway maintenance and construction are rural as well as municipal. Various types of surfaces are employed, including asphalt, concrete, and macadam.

Garbage Disposal. While primarily a health protection matter garbage collection and disposal is engineering in nature so far as operation goes. Collection offers the ordinary problems and routine. Disposal in the northern half of the Canal Zone is effected by means of an incinerator located at Mount Hope and by dumping and burying on waste land in the southern half. As with sanitation and street cleaning, the cost of garbage service to outsiders, including the cities of Colon and Panama, is charged to them.

Construction Work. Another phase of municipal engineering work includes the construction of streets, sewers, and water-supply necessities and miscellaneous structures, and concreting, grading, filling, excavation, and landscaping for the Army, Navy, Panama Railroad, "The Panama Canal," other government departments, and, on occasion, for private enterprises and the Panama Government. This work is billed at cost, plus a surcharge to cover overhead and interest on investment. The business aspect is more pronounced than with the other phases of municipal engineering. A code of building regulations is followed, and the buildings under construction are inspected to see if they comply with all regulations, as in municipalities of the United States.[41]

[41] This applies to structural matters only. The location of buildings and other structures, general community plans and all matters pertaining thereto are handled by a Board on Building Sites, which makes its recommendations to the Governor.

Public Safety. The activities included under the head of public safety involve police protection, the operation of penal institutions, and fire prevention and protection.

The police activities in the Canal Zone extend beyond those normally carried on under a municipal system and include duties usually performed by a state or federal department. The usual municipal duties of patrol, maintenance of order, and traffic regulation are carried out, but in addition the Zone police administer the laws concerning prohibition, narcotics, immigration, "white slave" traffic, deportations, and extradition. They also maintain harbor, river, lake, highway, and interior patrol, the last to prevent the unauthorized settlement of public lands. For "The Canal," details of police are maintained at all locks and at Gatun Spillway, the river and lake patrol is maintained by launches out of Gamboa and Gatun, while continuous harbor patrol is exercised at Balboa and Cristobal. Motor-cycle patrol for vehicle traffic regulation is maintained at Balboa, Pedro Miguel, Cristobal, and Gatun. Police censuses are taken at varied intervals, and confidential work is carried on for the United States Government from time to time.

The penitentiary is located at Gamboa, the convicts being employed on road and municipal improvements, on the maintenance of prison buildings and grounds, and in the manufacture and repair of prison clothing. Jail prisoners, similarly, are employed on road work, clearing of trails, janitorial service about police stations, and other miscellaneous jobs. Whenever possible legally, prisoners are deported at the termination of their sentences.

The fire department of the Canal Zone performs the usual fire-fighting service, on shore and afloat. It provides instruction and training for volunteer fireman, and makes periodical inspections of all government buildings, docks, storehouses, and yards, and attends to the maintenance of fire extinguishers and hose.

Judicial System. The District Court of the Canal Zone has original jurisdiction over all criminal cases in which the punishment that might be imposed exceeds a fine of $100 and imprisonment in jail of thirty days, all cases in equity, admiralty, and divorce and annulment of marriage, all appeals from judgments rendered in the magistrate courts, and offenses committed on the high seas

on American vessels if offenders are found in the Canal Zone or are brought into the Zone after the commission of the offense. This court issues writs of mandamus, certiorari, prohibition, habeas corpus, and quo warranto. It also administers estates, and may commit persons to the insane asylum for observation and detention.

Procedure and practice follow those of the United States district courts.[42]

The District Attorney conducts all the business, civil and criminal, and advises the Governor of "The Panama Canal" on all legal questions touching the operation of "The Canal" and the administration of civil affairs. The Marshal performs the usual duties of his office.

The magistrate courts have original jurisdiction over all civil cases in which the principal sum claimed does not exceed $300; all criminal cases where the punishment that may be imposed does not exceed a fine of $100 or imprisonment not exceeding thirty days, or both; all violations of police regulations and ordinances; and all actions involving possession or title to personal property or the forcible entry and detainer of real estate. The magistrates also hold preliminary investigations in all charges of felony and charges of misdemeanors in which the punishment that may be imposed is beyond the jurisdiction of the magistrate. These courts may also petition the District Court to commit persons to the insane asylum for observation.

Education. The public school system on the Canal Zone includes both grade and secondary schools for white children and grade schools for colored children. The white schools are conducted as nearly in accord with the latest methods in the United States as is possible and the attempt is made to afford the child instruction as able as that of the best public schools elsewhere. The colored schools, while admittedly less satisfactory both as regards methods and equipment, are offering opportunities to these people previously unavailable.

Postal System. The postal system of the Canal Zone affords another example of a service normally conducted by the United States Government but here wholly under the jurisdiction of "The

[42] The Circuit Court of Appeals (Fifth Circuit) of the United States has jurisdiction to review, revise, modify, reverse, and affirm final judgments and decrees of the District Court of the Canal Zone.

Panama Canal." Direct agreements are in force between the Canal Zone Director of Posts and the postal administrations of Costa Rica, Peru, Australia, and New Zealand for the handling of mails routed via the Isthmus of Panama.

Port Duties. "The Panama Canal" exercises full authority over a number of duties, normally under the jurisdiction of other government departments, which become necessary because of the position of the Canal Zone as a port. These are customs administration, including the prevention of narcotic smuggling, immigration regulation, Chinese exclusion, steamboat-inspection work, harbor patrol and rule enforcement, lighthouse service, admeasurement, quarantine, dredging, and shipping commissioner activities. A number of these have been already dealt with as closely related to other activities. A few remain, however, which deserve further discussion.

Customs. So far as tariff matters are concerned the Canal Zone is not regarded as territorially separate from the Republic of Panama, and it is subject to the same rules. Imports from the United States pay the regular duties imposed by Panama,[43] except on articles for the personal use of employees, of "The Panama Canal," the Panama Railroad, and the United States Army and Navy. As a consequence, all merchandise discharged at Cristobal or Balboa not consigned to "The Panama Canal," the Panama Railroad, the United States Army or the Navy and destined for delivery to persons or firms in the Republic of Panama, is placed in custody of Canal Zone customs officers until documentary proof is produced to show that duty has been paid or waived. Evidence of the payment of customs duties is required at all Canal Zone post offices before delivery is made of mail parcels containing dutiable articles consigned to non-employees.

Customs inspectors have the power of arrest for violation of customs regulations, and they are charged with the duty of suppressing smuggling.[44] Inspection and sealing of household goods belonging to employees returning to the United States are performed and invoices are certified. For these services a fee is

[43] Exports to the United States from the Canal Zone likewise must pay entrance duty as if from the Republic of Panama.

[44] Confiscated smuggled goods are turned over to the Republic of Panama, except narcotics, which are destroyed.

charged. Special after-hour service in inspecting passengers' baggage on board ship is also rendered at a fee.

Chinese Exclusion. The Chinese exclusion laws on the Isthmus are administered by customs officers of "The Panama Canal," the Immigration Service having no authority in the Canal Zone. Chinese crews of all ships are inspected upon arrival and departure to prevent illegal landing, either in the Canal Zone or the Republic of Panama. "The Canal" assumes responsibility for Chinese passengers in transit and landing, admitting to the Republic of Panama those certified for such admission by that government. "The Canal" cares for Chinese awaiting deportation or the continuance of their journey, and accepts bonds for the temporary release of such persons in the Canal Zone. The same functions are performed with regard to those races or nationals included in the "Barred Zone." [45]

Shipping Commissioner. The Shipping Commissioner of the Canal Zone performs the same duties as similar offices in the United States,[46] but is an employee of "The Panama Canal" and not of the Bureau of Navigation of the Department of Commerce.

In addition to the duties usually performed by shipping commissioners in the United States such officers in the Canal Zone carry on activities usually falling to American consuls in foreign ports. These include the arbitration of controversies between masters and crews, maintenance and return to the United States of shipwrecked and destitute seamen and of sick and injured seamen after their discharge from treatment in Canal Zone hospitals, and the disposition of wages and effects of deceased seamen.

Steamboat Inspection. The duties which, in the United States, fall to the province of the Steamboat Inspection Service of the Department of Commerce are performed by "The Panama Canal" in the Canal Zone.[47]

Relations with Panama. "The Panama Canal" carries on direct negotiations with the Republic of Panama in regard to

[45] See Institute for Government Research, The Bureau of Immigration, Service Monograph, No. 30.

[46] See Institute for Government Research, The Bureau of Navigation, Service Monograph No. 15.

[47] See Institute for Government Research, The Steamboat-Inspection Service, Service Monograph No. 8.

matters under dispute or needing adjustment. The great majority of such negotiations are of a routine nature, though those of larger import may be, and are, carried on. The Governor also contributes his services as an advisor to, and intermediary for, the Republic of Panama, in direct negotiations with the United States Government.

Administrative Activities. The administrative activities of "The Panama Canal" include those duties which are normally necessary to the proper conduct of any large enterprise, commercial or governmental. They are, with one or two exceptions, not peculiar to "The Panama Canal," and hence do not require detailed discussion except, perhaps, in a succeeding chapter as they concern organization. These activities involve matters of correspondence, records and files, statistics, accounting, auditing, payrolls, the purchasing, inspection, custody and requisition of supplies, preparation of annual and other reports, and the administration of personnel affairs. The last offers certain special conditions which deserve comment.

Personnel. The recruitment of employees, except for temporary unskilled labor, is practically impossible on the Isthmus. Paragraph six of the executive order of February 2, 1914, as amended February 20, 1920, reads as follows:

> All employees who receive compensation at the rate of more than $960 a year or 40 cents an hour, must be citizens of the United States or the Republic of Panama, and such citizens will be given preference for employment in all grades. Aliens may not be employed in such grades unless (a) they have occupied similar positions during the construction of the canal for two years or more, (b) in case of emergency, in which latter case they must be replaced by citizens of the United States or Republic of Panama as early as practicable.

The difficulty of obtaining adequately trained personnel from among the Panamans is obvious, and since there are few United States citizens on the Isthmus except those connected with "The Panama Canal" and the Army or Navy, it is necessary to recruit them in the United States. Hence officers charged with responsibility for administering "Canal" affairs on the Isthmus must accept, without an opportunity for previous personal interview,

employees chosen by a division located some two thousand miles away in Washington.

Conditions of Employment. Working conditions and privileges are also of greater than usual importance. The employee is practically entering foreign tropical service, isolated, and in a climate that is admittedly enervating. This demands concessions in the way of rates of compensation, annual leave, and other privileges.

Additional compensation, not to exceed 25 per cent above rates of pay for similar positions in government service in the continental United States is provided. Free transportation to the Canal Zone from the United States port of departure is granted to new employees, and compensation begins on the date of embarkation. At the end of three years' service, employees who are citizens of the United States and who wish to terminate their employment, are entitled to free transportation to the United States. Employees on personal trips to the United States are granted special reduced steamship rates, for themselves and their dependents. Gold employees receive one complimentary round-trip pass on the Panama Railroad per month, while employees' dependents may purchase commutation tickets at half-tariff.

Employees are entitled to free medical care and attendance in hospitals except for venereal disease and alcoholism. Likewise all citizen employees[48] are entitled to both annual and cumulative leave. The former amounts to twenty-four days per annum, with unconsumed days applicable to cumulative leave. The latter amounts to thirty days per annum, but an employee may not be paid for more than 120 days leave at any one time.[49] In addition, seven days travel leave with pay is granted to employees making a journey outside the tropics.

The Governor appoints all employees except the district judge, district attorney, marshal, and the clerk of the district court, and his assistant.

Compensation. The matter of wage or compensation scale adjustment is another phase of the personnel administration problem

[48] And alien employees whose compensation is greater than $960 per annum or forty cents an hour.

[49] Employees whose rate of pay is on a per hour basis are allowed but twenty days cumulative leave per year.

involving complications. The payroll, as has been previously indicated, is divided into "silver" and "gold" rolls for colored and white, or unskilled and skilled employees, respectively. Conditions governing the two groups are widely different.

For the gold roll a wage board has been established. This board does not initiate proceedings with regard to changes in rates of compensation but acts when a claim for increase is made. In such case the board obtains data showing rates for similar employment in the United States and examines the comparability of service, the duties and responsibilities of the employment in question, local coördination and other pertinent factors. Recommendations are then submitted to the Governor, who has power to authorize changes.[50] Meetings of the board usually average slightly less than one a week during the year.

The method of handling silver roll rates is that of continuous observation and alteration without initiation on the part of the employees. An index number of the cost of living for silver employees is derived quarterly from current prices in the Panama Railroad commissaries.[51] From this an indicated hourly rate for silver employees is set up, and a pay rate established.[52]

Grievances. As with compensation, adjustments, grievances and complaints of American employees are heard and considered by a grievance board composed of the Assistant Engineer of Maintenance, the head of the division in which the complaint originates, and two representatives of the employees nominated by the central body of the employees' organization. This board sits on the cases presented and reports its findings and recommendations to the Governor, in whom sole authority for action lies. All employees, however, American and alien, regardless of the board, have the right of direct appeal to the Governor.

No machinery has been set up to care for complaints of silver employees.

[50] The board is composed of an official representative of the administration and a representative selected by the organized employees.

[51] Silver employees purchase the great bulk of their supplies at these stations. The base is 1914 prices.

[52] With the exception of the year 1920 the adopted rate has always exceeded the indicated rate. At present the adopted rate of twenty cents per hour exceeds the indicated rate by 2.38 cents per hour.

Military Defense. The Canal Zone coast defenses are among the most formidable maintained by the United States, and adequate garrisons are provided to man them, while the Navy operates radio-stations and a submarine base and maintains a coal supply, which is handled by "The Canal" under direction of the Navy.

"The Canal" performs docking service and marine repairs for the Navy, and does building construction of varied sorts for both the Army and the Navy. Municipal services, including water, electricity, etc., are supplied to both branches, and the business enterprises are available for use by both Army and Navy. While the presence of the military population adds to the number of inhabitants and communities which must be served by "The Canal" organization, both on the governmental and business sides, it increases in no serious way the number, type, or complexity of such activities.

CHAPTER III

ORGANIZATION

"The Panama Canal" is an independent establishment of the United States Government, responsible solely to the President of the United States, but reporting, pursuant to his order, to the Secretary of War, who thus exercises supervision over the operations of "The Canal."

The principal activities are carried on at the Isthmus, though offices are maintained in New York City and Washington, D. C. Neither of these outlying offices performs "field work" in the usual government department sense, however, since the work of either could be carried on, although less efficiently, at the Isthmus.

General Administration. The Governor of "The Panama Canal" exercises complete executive and administrative authority and jurisdiction over "Canal" affairs and personnel,[1] subject only to the order of the President of the United States exercised through the agency of the Secretary of War.

This statement must be modified by certain exceptions however. The first is in case of war or the immediate threat of war, when the President is authorized by law to designate by executive order, an officer of the Army of the United States who shall have exclusive authority and jurisdiction over all "Panama Canal" affairs both as to operation and government, the Governor being subordinate to such officer. The second exception concerns the courts and the division of fortifications, which bear an extra-departmental relation and are not subject to the Governor's authority. They are placed under his jurisdiction nominally for administrative convenience.

[1] Subject to the limitations of Civil Service in certain specified positions (see Form 151—The Panama Canal—December 1, 1923, Manual of Information) and excepting the District Judge and Attorney and the United States Marshal, who are appointed by the President with the advice and consent of the Senate (42 Stat. L., 1004, 1005).

The Governor. The Governor is appointed by the President "by and with the advice and consent of the Senate for a term of four years and until his successor shall be appointed and qualified."[2] While qualifications for the office are not specified, they seem to have been established by custom or precedent. All incumbents have been officers of the Engineer Corps of the Army, with the rank of Lieutenant-Colonel or higher. Succession also, though not specified, has been consistent, each Governor except the first having advanced to his position from that of Engineer of Maintenance.[3]

The Governor in addition to his duties as general administrator of "Canal affairs" exercises specific authority in certain other fields. He is a member of the Board of Directors of the Panama Railroad Company, President of the Railroad, and head of the Department of Operation and Maintenance and of the Executive Department of "The Panama Canal." He also has some administrative duties in connection with the district and magistrate courts, the District Attorney, the United States Marshal, and the Division of Fortifications of the United States Army.

The law[4] charges him with certain additional duties, namely, the appointment of a sufficient number of magistrates and constables, and he must "appoint all notaries public, prescribe their powers and duties, their official seal and the fees to be charged and collected by them."

Finally, the Governor acts in a quasi-advisory and liaison capacity with regard to matters concerning the governments of the United States and the Republic of Panama.

The Office of the Governor. Although not so specified in organization charts or description, the focal point of executive control and general administration of "Canal" affairs for want of more indicative nomenclature, may be designated the Office of

[2] 37 Stat. L., 560, 561. While the term is four years, the average incumbency for the first ten years (1914-24) was slightly over three.

[3] There is not only logical reason for such succession in the experience and training of the Engineer of Maintenance but also indirect warrant in Executive Order No. 1885 (Jan. 27, 1914), which states ". . . Engineer of Maintenance, an officer of the Corps of Engineers, U. S. Army, shall act as Governor in the absence or disability of the Governor of The Panama Canal."

[4] Panama Canal Act (37 Stat. L., 560, 564, 565) and amendment (42 Stat. L., 1004, 1007).

the Governor. Due to the varied activities of the Governor, however, this office is concerned with numerous matters in addition to those relating to general administration. Upon analysis it may be said to comprehend an office of the Head of the Department of Operation and Maintenance, an office of the Head of the Executive Department, an office of President of the Panama Railroad and an office of Supervision of Extra-Departmental Activities.

These units do not exist in practice in the Governor's Office, and it is impossible to segregate accurately the employees aiding the Governor in the varied phases of his work. As Governor, however, and head of the Executive Department he is aided by a Secretary to the Governor and a member of the Wage and Grievance Board. As head of the Department of Operation and Maintenance, he is assisted by the Engineer of Maintenance, who employs an Office Assistant; and by the Assistant Engineer of Maintenance, who in turn employes an Assistant to the Engineer of Maintenance and an Office Assistant.

Engineer of Maintenance. While the Governor exercises complete control over matters of general policy he is aided on all executive work by the Engineer of Maintenance, who acts as his direct representative in the management of the governmental functions and business operations of "The Panama Canal" and the Panama Railroad on the Isthmus. Matters involving the following items are submitted to the Engineer of Maintenance for action:

1. New expenditures for
   - Construction
   - Operation
   - Maintenance
   - Government
   - Sanitation
2. Proposed increases in
   - Force
   - Established rates of pay
3. Work requests
4. Requisitions[5] for
   - Materials from the United States
   - Local printing and stationery

[5] All requisitions are reviewed by the Chief Quartermaster who brings to the attention of the Engineer of Maintenance, requisitions which, in his opinion, are unnecessary or excessive.

The Engineer of Maintenance, further, is charged with the duty of making studies in matters of organization, new projects, elimination of non-essential operations, reports of expenditures, and similar matters for the purpose of increasing economy and efficiency, and in connection therewith he must visit all activities and observe them in operation from time to time.

This officer is also required to coördinate the work of the various divisions, and to this end all matters affecting more than one division or department must be taken up with him before they are presented to the Governor.[6]

The Engineer of Maintenance is authorized to give orders to heads of divisions and departments in the name of the Governor and such orders bear the authority of the Governor.

All papers involving questions of policy, after decision by the Governor, are passed over the desk of the Engineer of Maintenance to keep him informed, and he visés official correspondence directed by heads of departments and divisions of "The Canal" and Railroad, to officials of the Army and Navy stationed on the Isthmus.

The Engineer of Maintenance thus acts, in effect, as vice-governor, and with the Governor may be said to round out what has here been arbitrarily termed the Office of Governor. This Office administers all "Canal" affairs, direct and indirect, working through the agency of six major departments.

These departments, which do not follow strictly functional lines,[7] are as follows:

1. Operation and Maintenance
2. Executive
3. Supply
4. Accounting
5. Purchasing
6. Health

[6] Matters affecting only one department or division, however, may be taken up with the Governor direct by a department or division head.

[7] For example, the Executive Department functions in the fields of government, administration, and housing and welfare, the Supply Department in housing and welfare and business operations of both the Panama Railroad and "The Canal," while the Salvage Sub-section engages in both business and non-business activities.

Department of Operation and Maintenance. The Department of Operation and Maintenance deals with the technical operation and maintenance features of "The Canal," in general distinction to the administrative and government activities.[8] The Department is composed of twelve major units, which may be called coördinate, although the lines of authority do not run the same for all. These units are:

1. Marine Division
2. Mechanical Division
3. Dredging Division
4. Panama Railroad
5. Fortification Division
6. Electrical Division
7. Municipal Engineering Division
8. Lock Operating Division
9. Section of Surveys
10. Section of Office Engineer
11. Section of Meteorology and Hydrography
12. Section of Gatun Dam and Backfill.

These units may be further subdivided according to what may be called "precedence of reporting," that is, the heads of these divisions report variously as follows:

Reporting directly to the Governor	Reporting directly to the Engineer of Maintenance	Reporting directly to the Assistant Engineer of Maintenance
1. Marine Division	1. Panama Railroad[9]	1. Electrical Division
2. Mechanical Division	2. Dredging Division	2. Municipal Engineering Division
3. Panama Railroad[9]		3. Lock Operating Division
4. Fortifications Division		4. Section of Surveys
		5. Section of Office Engineering
		6. Section of Meteorology and Hydrography
		7. Section of Gatun Dam and Backfill

Marine Division. The Marine Division constitutes the first unit reporting directly to the Governor. It is under the supervision of a Marine Superintendent and is charged with the general

[8] This is a generalization and holds true only in a larger sense. Numerous and obvious exceptions appear.

[9] A dual responsibility.

supervision and enforcement of the rules and regulations relating to the navigation of the canal, its terminal ports, and the water adjacent thereto; the dispatching and transit of vessels; the enforcement of harbor regulations; the supervision and assignment of pilots; the entrance and clearance of vessels at terminal ports; the towage of vessels through the canal; the handling of vessels in the terminal harbors, including the assignment and shifting of berths, anchorage, etc.; the supervision, establishment, and maintenance of lights, beacons, buoys, and other aids to navigation in the canal and adjacent waters; and the operation and maintenance of the marine salvage section. This division also has supervision over harbor craft and all such inspectional work as is normally carried on in United States ports by the Steamboat-Inspection Service and the Bureau of Navigation of the Department of Commerce.

The Marine Superintendent, in addition to his duties as head of the Marine Division, also acts as Chairman of the Board of Admeasurement and Supervising Inspector of the Board of Local Inspectors of the Steamboat-Inspection Service for the District of the Canal Zone.

The work of the Marine Division is allocated among six administrative units which are designated as follows:

1. Port Captain's Office, Cristobal
2. Port Captain's Office, Balboa
3. Lighthouse Subdivision
4. Harbor Craft Supervision
5. Board of Local Inspectors
6. Board of Admeasurement

Port Captains' Offices. The Port Captains' Offices are similarly organized, each being headed by a Port Captain, who is directly responsible to the Marine Superintendent. These officers supervise the anchorage, assignment of berths, docking, boarding, piloting, and certification of vessels for transit and call. They direct the boarding parties which meet all vessels and supervise admeasurement, toll-levying, dispatching, and cargo inspection.[10]

[10] The members of the boarding parties are drawn from various divisions, such parties consisting usually of a pilot (Marine Division), a quarantine officer (Health Department), a boarding officer (Bureau of Customs, Executive Department), an admeasurer (Marine Division), and a commissary representative (Supply Department).

The Port Captains' Offices, while showing no functional subdivisions so far as organization plan goes, employ an extensive personnel. The titles include the following:

Gold employees	Silver employees
Port Captain	Seamen
Assistant Port Captain	Operators
Chief Clerk	Boatswains
Clerks	Oilers
Harbor Master	Firemen
Assistant Harbor Master	Wipers
Chief Dispatcher	Office Helpers
Dispatchers	Messenger
Pilots	Boy
Foremen	Carpenters
Chief Admeasurers	Storeman
Admeasurers	Watchmen
Signalmen	Cooks
Masters	Waiters
Engineers	
Coxswain Engineers	
Radio Operator	
Machinists	
Oilers	

From the above it is obvious that in his general duties the Port Captain is aided by an Assistant Port Captain and that a clerical force of considerable extent, headed by a Chief Clerk, is maintained to care for the general office work of these units. Harbor masters and dispatchers complete the list of general supervising and directing employees, the rest of the personnel being engaged directly in operating and technical duties.

Lighthouse Subdivision. The Lighthouse Subdivision is directed by a Pilot-in-Charge, who is responsible directly to the Marine Superintendent. This subdivision carries on the work entrusted to it through two sections, which may be designated as:

1. Aids to Navigation
2. Salvage

The Aids to Navigation Section supervises the maintenance and operation of lighthouses, lights, buoys, and markers, including certain lights belonging to the Lighthouse Service, which under agreement with the Department of Commerce are cared for by "The Panama Canal." This work is under the immediate super-

vision of an Assistant Superintendent, who directs a staff which includes the following:

Gold	Silver
Electrical assistant	Boatswain
Ironworker	Oilers
Boatbuilder	Seamen
Clerks	Firemen
Coxswain engineer	Coal passers
Machinists	Carpenters
Masters [11]	Motor boat operators
Chief engineers [11]	Assistant light keepers
Assistant engineers [11]	Laborers
Mates [11]	Steward
Radio operator [11]	Cooks
Foreman [11]	Waiters
	Watchman

The Salvage Section is under the direct control of the Pilot-in-Charge. Service is given not only in "Canal" waters, but, on a fee basis, to ships in the Caribbean Sea and Pacific Ocean. A nucleus of trained men is permanently employed in the section, supplemented on special work by employees from other branches of "The Canal" organization.

Supervisor of Harbor Craft. The Supervisor of Harbor Craft supervises the operation and repair of towboats and small craft of the Marine Division. He is aided by an Assistant Supervisor of Harbor Craft.

Board of Local Inspectors. The Board of Local Inspectors is a supervisory, inspectional, and quasi-judicial body, of which the Marine Superintendent acts as Supervising Inspector. The other members are a navigation member and an engineering member. The Board employs one inspector of hulls and boilers and one recorder, who acts in addition as office assistant to the Marine Superintendent. Another office assistant is also employed.

The work of the Board in general is that comprehended by the Steamboat-Inspection Service and Bureau of Navigation in the United States. The Board investigates and reports on all accidents and inspects and reports upon all floating equipment. The latter activity includes a complete annual inspection of hulls in dry dock whenever possible and a general annual inspection and hydrostatic tests of steam boilers. Certificates of seaworthiness are issued

[11] Under the immediate supervision of the Pilot-in-Charge.

to eligible vessels, including foreign ships registered in countries having a reciprocal certificate treaty with the United States, and to motor boats. Floating craft licenses and number plates are also issued.

Board of Admeasurement. The Board of Admeasurement consists of three members, the chairman (who is the Marine Superintendent) and the two chief admeasurers of "The Panama Canal." The recorder of this Board acts in the same capacity for the Board of Local Inspectors. The Board of Admeasurement supervises and regulates all matters concerning the measurement of vessels to determine net tonnage, entertains appeals, and adjusts the bases for the levying of tolls where the dual system of measurement requires it. To carry out this work, there are employed two chief admeasurers and seven admeasurers.

Mechanical Division. The Mechanical Division is headed by a Superintendent, who reports directly to the Governor as head of the Department of Operation and Maintenance. It has jurisdiction over the shops, dry docks, and roundhouses at Balboa and Cristobal and the repair wharves at Balboa; the repair of all floating and other equipment for the various departments and divisions of "The Canal" which require shop, dry dock, or repair facilities; the railroad car inspection and repair system, including maintenance in proper working condition of all rolling stock, instruction of locomotive engineers, firemen, and hostlers, and the manning and operation of the railroad wrecking outfit; the maintenance of inspection services, including tests and necessary repairs, other than electrical, for all boilers of "The Canal" and railroad, except marine boilers, for all passenger and freight elevators, for weighing scales and other measuring devices, and for typewriters, calculating machines, clocks, and other instruments; the manufacture and distribution of compressed air and the manufacture of acetylene, oxygen, and hydrogen; the fabrication or construction of such machinery, equipment, and spare parts, as in the opinion of the Governor may be more expediently or economically made on the Canal Zone than purchased elsewhere; and in general, such repairs (except electrical) and other mechanical work as may be required by other departments on the Canal Zone or by foreign governments, commercial vessels, and individuals and companies. The Division does not make repairs to

automobiles, motor trucks, motorcycles, furniture, and such millwork, as is now authorized in Supply Department shops.

The duties above outlined are divided among four major organization units, which may be designated as follows:

1. General Office
2. Office of Assistant Superintendent
3. Cristobal Shops
4. Equipment and Roundhouses

General Office. The General Office has supervision over what may be called the overhead or general administrative functions of the Mechanical Division. The heads of the component units of this office are directly responsible to the Superintendent of the Division but detail instructions are given by the Assistant Superintendent as required for the conduct of the work in the shops and the supply and distribution of personnel.

The activities are divided among four units, namely:

1. Planning and Estimating Unit
2. Drafting Room
3. Accounting Section
4. Clerical and Records Unit

The Planning and Estimating Unit receives work requests and secures estimates from the shops involved, correlating and completing such requests and estimates. It also performs such job planning as is done by the General Office, issues job orders under which work is done by the various shops, closes these orders out when the job is completed, and follows up progress and material on important jobs. The unit is supervised by a Chief Planner, aided by assistants.

The Drafting Room is under the direction of a Supervising Draftsman. In addition to designing and the drafting work of a routine nature and the keeping of engineering records, the work of this section includes physical laboratory tests of engineering materials, conducting the school room for apprentices, and the preparation of engineering specifications.

The Accounting Section, headed by an Accountant-in-Charge, conducts a complete works accounting and job cost system similar to those carried on in industrial plants. It classifies job cost data

for ready reference and furnishes cost data on completed jobs for estimating purposes. It operates a cost control system for jobs in progress and prepares bills for collection.

The Clerical and Records Unit bears responsibility for all of the "overhead" duties not included under the three units above mentioned. At the head of the unit is a Chief Clerk, who supervises the work of six sub-sections:

1. Timekeeping
2. Requisition Clerk
3. Correspondence and General
4. Personnel and Issuing
5. Filing and Mailing
6. Property

The timekeeping subsection, supervised by the timekeeper, keeps the record of the time at work and the absences of employees.

The requisition clerk prepares requisitions for all special supplies and materials and keeps a record of awards, inspections, and deliveries.[12]

The correspondence and general subsection performs miscellaneous clerical duties. The chief clerk prepares all correspondence for signature except upon engineering and matters of policy. He has charge of the force of watchmen and shop clerks and is custodian of the office building records.

The personnel and issuing subsection prepares papers and keeps records relative to personnel, including employment, promotion, discharge, and leave papers. The chief of this subsection prepares the payrolls and issues the payslips and commissary advances.

The filing and mailing subsection performs the duties indicated by the title and conducts the messenger service.

The property subsection keeps the property records of the plant and equipment, including all non-expendable, loose, and hand tools.

Office of Assistant Superintendent. The Office of Assistant Superintendent has jurisdiction over the shops at Balboa, together with all work immediately attached thereto. This organization unit

[12] Standard material from storehouses is drawn direct upon individual shop requisitions. Technical data and specifications for incorporation in requisitions are furnished by the engineering or shop force as occasion dictates.

is headed by the Assistant Superintendent, who is directly responsible to the Superintendent and acts in his place in his absence. He regulates the supply of labor, both skilled and unskilled, to the demands of the division and the Balboa shops in particular and the transfer of skilled labor between the Balboa and Cristobal shops. He administers discipline at the Balboa shops, subject to the Superintendent's direction, recommends promotions and changes, and passes upon leaves of absence and similar privileges. He is responsible for the maintenance, improvement, and operation of the shops and dry dock at Balboa and for the conduct of all work performed. He acts as liaison between shops and the General Office and coördinates the work of the General Office with that of the shops, giving such instructions as may be required to facilitate the prompt functioning of the office activities, thus enabling the shops to operate more efficiently, and to furnish information and records promptly from the shops for office use.

These are the normal duties of the Assistant Superintendent. However, under special conditions a change in organization is brought about. When new hulls are under construction or marine repair work of a complicated, unusual, or extended nature is undertaken, a naval constructor from the United States Navy is detailed as Assistant to the Superintendent and shares with the Assistant Superintendent certain duties of that office. In such case the Assistant Superintendent is designated as "Engineer Assistant," and the Assistant to the Superintendent as "Production Assistant."

The Engineering Assistant has supervision of engineering projects which includes the preliminary study of all work to be undertaken by the division. Upon receipt of a request for an estimate he investigates the work required, decides on what work is necessary and how it shall be carried out, and issues instructions to the Production Section necessary to enable it to prepare estimates. He is responsible for the proper upkeep and repair of buildings and equipment and for studies on extensions or replacements. He has cognizance of questions relating to hiring, discharging, and disciplining labor, is responsible for obtaining necessary materials and for shop methods, and makes any required special investigations.

The Production Assistant is, generally, responsible for the economical and efficient performance of the work of the division out-

side the shops. He controls the use of the dry dock and the work of the dry dock and repair wharves. He sees that all work called for on orders is properly carried out and that dates of completion are met, and he is especially charged with the coördination of the outside work of the various shops. In addition he has charge of the estimating and planning sections.

The general work of the Office of Assistant Superintendent, under the Assistant Superintendent, is divided among ten units, which are designated as follows:

1. Car Department
2. Machine Shop
3. Foundry and Pattern Shop
4. Wood Shop and Dry Dock
5. Paint Shop
6. Boiler and Shipfitting Shop
7. Instrument Repair Shop
8. Rigging and Sail Loft
9. Yard Office
10. Power Plant

The Car Department is headed by a General Foreman, the work under his supervision being divided among four units, of which the first assumes much the greatest importance:

1. Car Shop (Balboa)
2. Mt. Hope and Colon Terminal Inspection
3. Balboa Yard Inspection
4. Panama Terminal Inspection

The car shop cares for the maintenance, repair, and construction of all cars used on the Panama Railroad. This shop also operates a small rolling mill for producing reenforcing rods and bolts out of old rails and other scrap material. It employs the following types of labor:

Foremen
Cabinet makers
Machinists
Coppersmiths
Rollers
Car repair headmen
Car repairers
Car carpenters
Planing mill hands
Welders
Silver laborers

The Mt. Hope and Colon terminal inspection force conducts the car inspection at the Atlantic end of the railroad to insure that cars and lading and the safety equipment required by the Interstate Commerce Commission rules are in good order for safe passage over the railroad. This section also performs terminal cleaning of passenger equipment, makes running repairs, and

maintains a small car shop for limited repairs. The work is under the direction of a foreman.

The Balboa and Panama inspection forces inspect cars at the Pacific end of the railroad. In addition, at the Panama Yard certain light repair work is performed and terminal cleaning of passenger equipment is carried on.

The Machine Shop, the second of the major units reporting to the Assistant Superintendent, is under the direction of a Master Machinist with subordinate supervisors. The work of the shop is divided among five sections:

1. Machine Shop proper
2. Outside Machinists
3. Plant Machinists
4. Tool Department
5. Pipe, Copper, and Sheet Metal shop

The machine shop proper includes the work usual to such an organization engaged on jobbing and general repairs. It is equipped to machine the largest pieces of equipment on the Panama Canal as well as the largest parts on ships. It is also equipped for economical manufacture of small pieces.

The outside machinists, under direction of an intermediate foreman, are generally employed on the overhaul or repair and adjustment of machinery in place outside the shop, particularly on board ships at repair wharves. This force installs new machinery in floating equipment under construction, or ships under partial rehabilitation.

The plant machinist force maintains the buildings and machinery throughout the entire Balboa shops, conducts all plant and yard improvement work, and in addition conducts safety inspection of passenger and freight elevators on the Isthmus.

The plant machinist supervises this section as well as the tool department. The latter organization maintains and manufactures fine and special tools for the division as a whole, makes jigs, dies, and fixtures and maintains all pneumatic tools and hammers for the Balboa shops.

The pipe, copper, and metal shop performs all work upon pipe, all copper-smithing and all work in sheet metal and in light plate performed by the Balboa shops with certain exceptions. This applies both to work fabricated in the shop and to repairs performed on ships.

The Foundry and Pattern Shop, the third of the major units under discussion, is composed of two allied units: the foundry and the pattern shop. The former makes castings of all sizes in steel, iron, brass, and the various varieties of bronzes and nonferrous metals. The pattern shop comprises a section of the foundry, the foundry foreman has charge of both.

The Wood Shop and Dry Dock is under the charge of a General Foreman, who also discharges the duty of dockmaster for the drydocking of ships. The Wood Shop activities are divided between shipwrights' force and the planing mill. The shipwrights are principally outside workers, who do the various classes of woodwork required on ships and floating equipment and in addition are charged with preparing the dry dock and landing ships within it. The planing mill is engaged in the preparation and finishing of wooden parts and equipment which the shipwrights use in repairs and construction and in the various wood products required by the Mechanical Division other than in the car shop. The section includes a saw mill and a boat building department. The dry dock operated in conjunction with the Wood Shop is sufficiently large to accommodate any ship now built or definitely contemplated.

The fifth coördinate unit is the Paint Shop, which is headed by a Foreman. This shop refinishes the passenger coaches of the Panama Railroad, cleans and paints the bottoms of ships in dry dock, performs a variety of ship, structural, and miscellaneous painting, does varnishing and refinishing, including automobiles, and manufactures paint for local consumption.

The sixth major unit under the Assistant Superintendent is the Boiler and Shipfitting Shop, under the supervision of a General Foreman. Three units carry on the work of the shop:

1. Boiler and Ship Fitting Shop proper
2. Forge Shop
3. Gas Plant and Welding Force

The boiler and shipfitting unit is equipped for turning out work on the heaviest and largest varieties of steel plate. It repairs all types and sizes of boilers, stationary, marine, and locomotive, and builds such boilers occasionally. The shipfitting division of the

shop performs all classes of work upon ships' hulls, such as repairs, renewals, rehabilitations, and new construction of tugs and barges. A variety of steel structural work is also performed.

The forge shop is equipped with hydraulic forging press, steam hammers, and miscellaneous semi-automatic power forging equipment, capable of working in nickel steel up to large dimensions.

The gas plant makes oxygen for welding and cutting, makes such hydrogen as is needed, and manufactures acteylene for welding and cutting and for the local lighthouse establishment. The lighthouse services of several Latin American countries procure acetylene for lighthouses and buoys from this plant. Oxy-acetylene, electric, and thermit welding and lead burning are carried on.

The Instrument Repair Shop, the seventh major unit under the Assistant Superintendent, is headed by a Sub-Foreman. It repairs and constructs office machines and cash registers, and repairs typewriters, adding, and calculating machines, counting machines, cash registers, and other delicate apparatus, such as engineering and optical instruments, surgical instruments, clocks, chronometers, and time stamps. Gauges, scales, locks, and miscellaneous pieces of apparatus are repaired and the shop operates an electric plating and galvanizing plant and a distilling plant for battery water. It also conducts the inspection of scales and weights and measures on the Isthmus.

The eighth unit under discussion is the Rigging and Sail Loft, headed by a Foreman, who acts also as Wreckmaster for the Panama Railroad. It arranges the rigging for handling heavy material about the shops, at the repair wharves, and in the dry dock. It performs deep sea diving and operates locomotive cranes about the plant. It cleans oil holds and similar spaces, does cable splicing and bench rigging work on wire and cordage, and manufactures articles out of sail canvas. The wreckmaster, cranemen, and riggers for the Panama Railroad wreck train are supplied from this shop.

The Yard Office, the ninth major unit, is in charge of a Foreman and furnishes interyard and intra-shop transportation by switch-engine, motor truck, and storage battery truck. It is the receiving and shipping agency for the plant. It secures receipts for completed parts and is responsible for yard maintenance and cleaning and for rubbish removal. It delivers and secures credits

for usable scrap and second hand material, makes bicycle repairs, ices shop coolers, and performs a variety of service functions.

The Power Plant, last of the major units under the Assistant Superintendent, is headed by a Foreman, who is also Chief Power Plant Operator. This unit includes the dry dock pumping plant, the central compressor air plant and distributing system, the electrical transforming and distributing sub-station, and a boiler plant for industrial steam. The Power Plant Foreman inspects and maintains the electrical equipment for drydock auxiliaries contained in pockets under the dock wall.

Cristobal Shops. The Cristobal, or Mt. Hope Shops constitute a major unit under the Mechanical Division, and in general perform repair, maintenance, and construction work similar to the shops at Balboa but on a restricted scale. They are much less extensive than those at Balboa and are not equipped for heavy work. The dry dock here accommodates only small sea-going vessels.

These shops, at the opposite end of the Canal Zone from those at Balboa, are like a branch plant of an industrial corporation. They are under supervision of a Production Superintendent, who is directly responsible to the Superintendent of the Mechanical Division. The Production Superintendent deals directly with his customers, bills his work directly, and directly controls the conduct of work within the shop and the internal administration of the plant. Skilled labor, however, is shifted between Balboa and Cristobal Shops as conditions demand. The Cristobal Shops handle only certain classes of work and work which may be sent to one plant or the other depending on which is short of work.

The work of the shops is distributed among seven units as follows:

1. Office
2. Machine Shop
3. Marine Gang
4. Boiler Shop
5. Wood and Rigger Shop
6. Forge Shop
7. Paint Shop

The organization of these units is similar to that at Balboa, but on a smaller or compressed scale. The Office cares for the general overhead and clerical work of the shops. It is directly under the authority of the Production Superintendent and is immediately

supervised by a Clerk-in-Charge, who also acts as planner. It has, however, no drafting section, requisition clerk, or property clerk, these services being supplied from Balboa.

The Machine Shop is supervised by a foreman, assisted by leading men. In general it discharges the same functions as at Balboa but the foundry is part of the shop organization, the output being limited to small articles of cast iron and brass. Locomotive cranes are included under the shop.

The Marine Gang composed of outside machinists, including at Cristobal, coppersmiths, pipefitters, and sheet metal workers, is nominally under the Machine Shop as at Balboa. In practice so much of its work is done at the commercial docks that it is at times almost independent. A few machine tools, in fact, are kept at the commercial docks for the convenience of the Marine Gang.

The Boiler Shop includes shipfitters and welders and does not possess large rolls or planers for heavy work. No locomotive or heavy work is done, the work performed being much lighter than at Balboa. Welding gases are obtained from Balboa.

The Wood and Rigger Shop is under the supervision of a Foreman, who acts also as dockmaster at Cristobal dry dock, and being a qualified deep-sea diver, does such diving as is required. The work of the shop is similar to that at Balboa. The plant for pumping at dry dock and for supplying compressed air to the shops is attached to the Wood and Rigger Shop organization. Likewise, the rigger at the Cristobal Shops is under the Wood Shop supervision, and such patterns as are required for the foundry are made in this shop.

The Forge Shop is limited to such work as can be turned out under an ordinary steam-hammer, the working force being too small to require a shop supervisor.

The Paint Shop has a leadman in charge. Railroad coaches are not worked upon in this shop, and the paint is obtained from Balboa.

Equipment and Roundhouses. Equipment and Roundhouses comprise another major section under the Mechanical Division. The direction of this section is placed under a General Foreman, who is entitled "Road Foreman of Equipment and General Foreman of Roundhouses." That portion of this officer's duties as Road Foreman of Equipment falls under the supervision of the

Superintendent of the Panama Railroad. For his duties as General Foreman of Roundhouses he is directly and solely responsible to the Superintendent of the Mechanical Division, the roundhouse work being coördinated with the railroad work through the latter offices. On engineering matters the General Foreman of Roundhouses reports to the Superintendent through the Assistant Superintendent.

As Road Foreman of Equipment it is the duty of the General Foreman to inspect the operation of locomotives by riding them over the road between terminals, to instruct the locomotive firemen and engineers in their duties, to regulate the provision and assignment to runs of firemen and engineers, to supervise their call outs and reporting for duty and their reliefs, and to sit in on examinations and disciplinary hearings for engineers.

As General Foreman of Roundhouses this officer has general charge of roundhouses and water stations and personally directs the Balboa roundhouse. He also has charge of the periodical inspection and tests of all stationary and locomotive boilers on the Isthmus, the work being done directly by the boiler inspector, who reports to the General Foreman's office. There is a Roundhouse Foreman in immediate charge of the Cristobal roundhouse.

Both roundhouses are devoted to the care of Panama Railroad equipment. As there are no outside hostlers the locomotives are delivered, in steaming condition with fuel and water for the run, at the roundhouse track to the road crews, these crews " deadheading " the locomotive to and from the terminal. The work at each roundhouse consists of hostling, which includes shutting down, securing, and cleaning a locomotive after a run, and delivering it ready for a run in proper mechanical condition, with steam raised and supplied with fuel, water, sand, and supplies; of making both light and heavy repairs; of care for and washing of boilers; and of rebuilding or extensively repairing the mechanical parts of locomotives. While locomotives are not sent to a back shop for mechanical repairs, the roundhouses do not do heavy boiler repairs, but send locomotives to the boiler shop at Balboa for such work. The roundhouse foremen are custodians of the railroad wrecking outfits.

The Panama Railroad. The Panama Railroad maintains communication by rail between the Atlantic and Pacific Oceans across

the Isthmus, operates a steamship line, and has supervision over various of the "business operations" in the Canal Zone.

It is a corporation of the State of New York, the stock of which is entirely owned by the United States Government except for a few qualifying shares for directors. Its policies are formulated by a Board of Directors of thirteen members, including the Assistant Secretary of War, the Governor of "The Panama Canal," the Engineer of Maintenance, the General Purchasing Officer, and other "Canal" employees.

The administration of railroad affairs lies in the hands of fourteen officers, who bear the following titles and are located at the points indicated:

President	Balboa Heights
Vice-President	New York
Second Vice-President	Balboa Heights
Third Vice-President	New York
Treasurer	New York
Auditor	New York
Secretary and Assistant to Vice-President	New York
Superintendent	Balboa Heights
General Purchasing Officer	Washington
Commissary	Balboa Heights
Commissary Purchasing Agent	New York
Resident Engineer	Cristobal
Terminal Superintendent	New York
General Counsel	New York

The general offices are at 24 State Street, New York City, and from this office the steamship lines and the general corporate and overhead activities are conducted. The majority of the operating activities are carried on in the Canal Zone, but the New York office has supervision over the purchase of coal and commissary supplies for the account of the railroad, the keeping of the general books and records covering all transactions of the company and the payment of bills. While it is impossible to segregate accurately the time spent proportionately by the New York office on railroad and steamship affairs, the company has estimated it generally as shown in the tabulation on page 228.

At the head of the organization is the President, who is also Governor of "The Panama Canal." The President has under his

immediate jurisdiction six major units, which may be designated as follows:

1. Vice-President
2. Second Vice-President
3. Supply Department
4. Accounting Department
5. Legal Department
6. Superintendent

APPORTIONMENT OF TIME IN PER CENT

Title	Railroad	Steamship
Vice President	50	50
Third Vice President [13]	...	...
Assistant to Vice-President and six employees	25	75
Treasurer and four employees	60	40
Auditor and nineteen employees	50	50
Freight Agent and thirty-three employees	...	100
Passenger Agent and two employees	...	100
Claim Agent and five employees	25	75
General Purchasing Officer	100	...
Commissary Purchasing Agent and twenty-seven employees [14]	80	10
Terminal Superintendent and 393 employees [15]	...	100
Resident Engineer	25	75
General Counsel and three employees	25	75

Vice-President. The Vice-President has under his supervision ten units or officers, and is aided in his work by an Assistant, who also acts as Secretary of the Board of Directors and as operating head of the steamship line. Six assistants are employed in this work. The units mentioned include:

1. Third Vice-President
2. Treasurer
3. Auditor
4. General Counsel
5. General Purchasing Officer and Commissary
6. Passenger Agent
7. Freight Agent
8. Claim Agent
9. Resident Engineer
10. Terminal Superintendent

The office of Third Vice-President for some time has been a nominal office with no specific responsibilities,[16] although accord-

[13] On leave of absence.
[14] Panama Canal 10 per cent.
[15] New York and Cristobal service.
[16] The incumbent has been on leave by order of the Secretary of War, serving with the United States Lines.

ing to the by-laws this officer is the operating head for the steamship lines.

The Treasurer bears the usual responsibilities of such an officer in a corporation and employs four assistants.

The Auditor has supervision over the fiscal and property transactions of the Railroad in coöperation with the Accounting Department of "The Canal." The Auditor, at present, serves as Acting Third Vice-President in charge of accounting and financial matters involving both the steamship line and the railroad. Nineteen employees, in addition to the Auditor, are engaged in this work.

The General Counsel is the legal representative of the Railroad in all its corporate and other relations except for land matters on the Isthmus. The General Counsel is assisted by three employees.

The General Purchasing Officer bears a coöperative relationship, since the incumbent is also General Purchasing Officer of "The Canal" and Chief of the Washington Office. The railroad maintains purchasing agents at New York,[17] New Orleans, and San Francisco, these offices also making purchases for "The Panama Canal" on a lump sum basis.

The Commissary Purchasing Agent has supervision over the purchasing of supplies for commissary consumption and maintains a force of twenty-seven men, the Commissary Division work being financed by the railroad but conducted by "The Canal" organization. He gives most of his time to the railroad company matters.

The Passenger Agent employing two men, the Freight Agent employing thirty-three, and the Claim Agent employing five, perform the usual duties of such officers of a transportation enterprise, dealing respectively with obtaining business, passenger and freight, and adjusting claims made against the corporation for damages to property, while in its custody.

The Resident Engineer has general supervision over repairs to ships of the steamship line made on the Isthmus under instructions from the Consulting Engineer as confirmed by the New York office.

The Terminal Superintendent has jurisdiction over and devotes his time wholly to the terminals of the steamship line in New York City, including the loading and discharge of freight and

[17] The Commissary Purchasing Agent.

handling thereof on piers. He also has authority with regard to details of management over the crews of vessels operating in the regular freight and passenger service between New York and the Canal Zone. He reports to and is under the authority of the Vice-President and employs 393 men.

Second Vice-President. The Second Vice-President, directly responsible to the President, is also Engineer of Maintenance of "The Panama Canal." He has under his direction the telegraph, telephone, and railway signal work. This work, however, is done for, and not by, the railroad, though it is considered a railroad enterprise for accounting and financing purposes. Telephones, telegraph, and railway signals are supervised and controlled directly by the Electrical Division of "The Panama Canal," under an Electrical Engineer. Telephones and telegraph come immediately under the direction of a Supervisor, as do railway signals, each being under jurisdiction of the Electrical Engineer.

Supply Department. The Supply Department is a unit under "The Panama Canal," and performs certain services for the railroad in connection with the Commissary Division which it operates for the account of the railroad. It is a coöperative relation, the Department, strictly speaking, not being a part of the railroad organization.

Accounting Department. The Accounting Department of "The Canal" bears a relation to the railroad similar to that of the Supply Department, since it keeps the general and commissary accounts for the railroad. It it not, however, a part of the railroad organization.

Legal Department. The Legal Department is headed by a Counsel, who is directly responsible to the Governor and President of the railroad. He is aided by an Assistant Counsel and Land Agent. The Department is concerned with the general legal affairs of the railroad on the Isthmus and with the leasing and administration of railroad lands in the cities of Colon and Panama and public lands in the Canal Zone. The expense of the office is borne by the railroad, but a monthly charge is rendered against "The Canal" for services performed.

Superintendent. The Superintendent has under his direction the general operating activities of the railroad on the Isthmus, including the steamship lines. He bears a divided responsibility.

With regard to the maintenance, improvement, replacement, or new construction of the railroad company's plants on the Isthmus he is responsible to the Engineer of Maintenance. On all other matters he reports to the Governor and President of the railroad.

The Office of Superintendent, headed by the Superintendent, also employs an Assistant to the Superintendent and a Commercial Agent. The first is general administrative assistant to the Superintendent with regard principally to operations. The Commercial Agent is concerned primarily with the revenue producing activities of the railroad and steamship line on the Isthmus. The Office of Superintendent directs the operation of the railroad and the steamship line on the Isthmus, as well as the handling of freight to and from vessels at the terminal ports. It also supervises the operation of the coaling plants at Balboa and Cristobal and the stables in the cities of Colon and Panama, the leasing of lands and buildings belonging to the railroad and situated in the terminal cities, the operation of the baggage transfer system, and acts as representative of various steamship lines, the vessels of which transit the canal or make one of the terminals a port of call.

To carry out these numerous duties eleven subordinate units have been established, designated as follows:

1. Master of Transportation
2. Roadmaster
3. Motor Car Inspector
4. Local Agent, Balboa
5. Local Agent, Panama
6. Station Agent, Colon
7. Station Agent, Panama
8. Steamship Ticket Agent
9. Receiving and Forwarding Agent
10. Superintendent, Coaling Plants
11. Superintendent of Stables and Stockyards

The Master of Transportation has charge of the dispatching, movement, and storage of rolling stock while in active service. The work is divided among five subdivisions:

1. Panama-Balboa Terminal
2. Colon-Cristobal Terminal
3. Line Operation
4. Line Stations
5. Train Dispatchers

The Panama-Balboa terminal, directly under the supervision of the Master of Transportation, controls the switching and classifying of freight cars and the storage of rolling stock between runs in addition to the usual freight station clerical work.

The Colon-Cristobal terminal is in charge of a general yardmaster and, as at Balboa, controls the classifying, switching, and storage of rolling stock between runs, as well as the necessary clerical work in connection with the freight office.

Line operation involves the operating of trains between terminals and the usual duties connected therewith.

The line stations employ agent-operators, ticket-operators, relief operators, and extra operators, in addition to clerks, office helpers, porters, and crossing flagmen.

The roadmaster's office, besides the roadmaster, who reports directly to the Superintendent, employs a general foreman. This office has supervision over maintenance of way and consists of three sub-units:

1. Assistant Engineer
2. Bridges and Buildings Gang
3. Section Gangs

The assistant engineer conducts all surveys in connection with right of way and track and structure layout and location. The bridges and buildings gang cares for the maintenance and repair of right of way structures. The section gangs attend to ballast maintenance, track and tie repairs, weed removal, switch maintenance, and lights.

The Motor Car Inspector has charge of the equipment for the inspection of gasoline-motor cars, furnishing transportation to inspecting officers traveling over the line. He reports directly to the Superintendent for such service. Maintenance and repairs, however, while falling under the same officer, are conducted by the Transportation Division of the Supply Department, " Panama Canal."

The Local Agents at Balboa and Panama report directly to the Assistant to the Superintendent. They attend to general freight agent and revenue duties.

The Station Agents at Colon and Panama, also reporting directly to the Assistant to the Superintendent, are in charge of the railroad

stations at the points indicated and have custodial, clerical, and supervisory duties.

The Steamship Ticket Agent, reporting as the other agents, has charge of the sale of steamship tickets on the Isthmus.

The Receiving and Forwarding Agent has authority over all transshipment, handling, rehandling, and storage of freight at the harbor terminals and is responsible to the Superintendent. The work is divided among two units, the Cristobal docks and the Balboa docks, each under control of an Assistant Receiving and Forwarding Agent.

The Coaling Plants are under the supervision of a Superintendent, who is aided by an assistant. The Superintendent's Office includes the Superintendent, a materials foreman, and the necessary clerical assistance. The Assistant Superintendent has immediate charge of the technical work of the plants, which is divided among four sections:

1. Operating and Mechanical
2. Balboa
3. Stevedoring
4. Electrical

The Operating and Mechanical Section is supervised by a Chief Operator who reports to the Assistant Superintendent. This section cares for the operation and maintenance of the coal handling machinery of the Cristobal Plant other than electrical. The Balboa Section, which operates the coal loading facilities at the point indicated, is under the charge of a Chief Operator, who has a small staff of men regularly employed. The plant is operated as needed by employees sent from Cristobal. The Stevedoring Section cares for the manual processes of coal loading and trimming and is headed by a Chief Stevedore. The Electrical Section is responsible for the maintenance and operation of the electrical portions of the coal handling machinery and is headed by a Supervisor.

The Superintendent of Stables and Stockyards at Colon is charged with the duties indicated by his title.

Fortifications Division. The personnel of the Fortifications Division is carried on the rolls of the Department of Operation and Maintenance for convenience of administration only. The division is in the charge of an officer of the Corps of Engineers,

United States Army, designated by the Chief of Engineers, under whose direction the work of the Division is executed.

Dredging Division. The Dredging Division performs all the dredging, sluicing, ditching, drilling, and blasting in connection with canal channel and terminal harbor maintenance and improvement, and disposes of the spoil. It also has charge of the removal of slides and the prevention thereof; the reclamation of land by hydraulic filling; the production, storage, and handling of sand and gravel; the removal of water hyacinths and other noxious plants from the canal and tributary waters; the collection and disposal of driftwood in the canal channel between Pedro Miguel Locks and the dredge dumps in Gatun Lake; the making and charting of hydrographic surveys of the canal and its terminal harbors, and topographic surveys in connection with ditching and dredging projects; and the maintenance and operation of dredging and other equipment assigned to the Division.

The Division is headed by a Superintendent, who reports directly to the Engineer of Maintenance. Under his supervision are seven major units, as follows:

1. Office of Assistant Engineer
2. Dredging Supervision
3. Shops and Cranes
4. Channel and Harbor Improvements
5. General Surveys
6. Division Office
7. Inspection of Navigable Channels and Harbors

Office of Assistant Engineer. The Office of Assistant Engineer as the name indicates is headed by the Assistant Engineer, who reports directly to the Superintendent of the Dredging Division and in addition to miscellaneous duties incumbent upon him as the principal assistant of the Superintendent distributes the work among four sub-divisions titled, respectively:

1. Hyacinth Extermination
2. Gravel Plant
3. Dump Inspection
4. Handling Supplies

The Hyacinth Extermination unit removes hyacinths and other noxious plants from the canal and tributary waters. The work

is generally performed by one gold employee aided by twenty silver laborers. This unit also collects and disposes of driftwood in the channel of the canal between Pedro Miguel Locks and the dredge dumps in Gatun Lake. The Gravel Plant is also under the supervision of a gold employee, with a staff of nine silver laborers.[18] The activities include the production, storage, and handling of sand and gravel. The Dump Inspection Unit cares for the distribution of dredging, spoil, and the economical use of dumping areas in Gatun Lake. The handling of supplies for the entire dredging organization requires one gold foreman and twelve silver helpers.

Dredging Supervision. The unit designated as Dredging Supervision has jurisdiction over dredging, disposition of spoil, sluicing, ditching, grading, removal of slides and slide prevention, and the reclamation of land by hydraulic filling. It is composed of three geographical sub-divisions; Atlantic, Pacific and Gaillard Cut. These three units are directed by a Supervisor, who, in addition to exercising general supervision, through assistants, over dredging at the Atlantic and Pacific entrances, personally supervises all dredging activities in the Gaillard Cut section.

Dredging Supervision thus is composed of fourteen units, which report directly to the Supervisor and are designated as follows:

1. Tug "Bohio"
2. Tug "Bolivar"
3. Tug "La Boca"
4. Tug "Mariner"
5. Dredge "Gamboa"
6. Dredge "Paraiso"
7. Dredge "86"
8. Launch "Siri"
9. Relay Pump Barge
10. Crane Boat "La Valley"
11. Pipe Line Gang
12. Barge Repairs
13. Relief Men
14. Grader "3"

The four tugs are engaged in hauling scows and other general work, including assistance to commercial shipping in Gaillard Cut

[18] This operating force includes only that required for loading cars from the storage pile. When sand and gravel are being produced, a dredge and necessary auxiliary equipment and additional personnel are employed.

and Gatun Lake. The dredges "Gamboa," "Paraiso" and No. 86 care for the dredging work. The pipe line gang is concerned with the laying, shifting and maintenance of pipe line on shore or afloat while the work of the barge repair group is indicated by the name. The launch "Siri" is engaged in transporting employees or materials. The relay pump barge acts as a "booster" for the suction dredges while the crane boat "La Valley" is used in handling heavy pieces of material and equipment. This vessel is also equipped with a ten-inch centrifugal pump which is used for dredging sea sand whenever this class of material is required. On this work the "La Valley" fills and tows her own barges. The relief gang consists of tug-boat, dipper-dredge, and pipe-line suction dredge men and other miscellaneous employees not definitely assigned to any particular plant but needed for relief in case of vacation, sickness or other emergencies.

One of the geographical groups under the Dredging Supervisor is the Balboa, or Pacific District, which is directed by an Assistant Supervisor. The work is divided among five units, as follows:

1. Balboa Office
2. Dredge "Cascadas"
3. Tug "Gatun"
4. Repair wharf
5. Barge repairs

Each of these units reports directly to the Assistant Supervisor. The Balboa Office, headquarters for the Assistant Supervisor, is employed in general clerical and custodial work. The repair wharf and barge repairs units have names which indicate their functions. The dredge "Cascadas" and the tug "Gatun" are engaged respectively in dredging and in scow towing, the latter also rendering occasional assistance to commercial shipping.

The Cristobal, or Atlantic District, directed by an Assistant Supervisor includes three units:

1. Dredge "83"
2. Pipe Line Gang
3. Launch "Birdena"

The dredge, the pipe line gang, and the launch perform functions similar to those previously mentioned.

The Gaillard Cut dredging has been mentioned and it should be noted that while certain equipment may be shown under the general description of "dredging supervision" as operating in specified districts it is frequently necessary to shift equipment from one district to another and at times no work at all is being performed in the Atlantic District.

Shops and Cranes. The third main sub-division under the Superintendent of the Dredging Division is called Shops and Cranes, the name being indicative of the type of equipment over which the unit exercises supervision and by means of which it performs repair and maintenance work. This sub-division is directed by a Master and Supervisor, who is aided by an Assistant Supervisor, the technical activities being divided among six units:

1. Office and Miscellaneous
2. Locomotive Crane No. 53
3. Cranes "Ajax" and "Hercules"
4. Shops and Motor Boats
5. Cleaning and Painting Hulls
6. Utility Gang

The office and miscellaneous unit performs general clerical and custodial duties. The cranes are used in the lifting and removal of heavy equipment, the locomotive crane being employed on shore for lighter work wherever tracks are available, while the "Ajax" and "Hercules" are large floating cranes, capable of the heaviest type of work. The unit in charge of general shop work and motor boat maintenance performs emergency repair and replacement work on dredging equipment. The cleaning hulls and painting unit and utility gang are explained by their titles.

Channel and Harbor Improvements. The fourth section under the Dredging Division is called Channel and Harbor Improvements. It is concerned with the improvement of the channel and serves to employ continuously equipment which may be needed at any time for a slide.

The work is supervised by a General Foreman, the activities being divided among three units.

1. Drill Barge "Teredo No. 2"
2. Air compressor Barge No. 27
3. Shore Drilling and Blasting

General Surveys. The fifth general subdivision of the Dredging Division is General Surveys, which is concerned with the making and charting of hydrographic surveys of the canal and the terminal harbors, and topographic surveys in connection with ditching and dredging projects. These activities are supervised by a Junior Engineer.

Division Office. The Division Office, under a Chief Clerk, is the sixth main section under the Dredging Division and performs general clerical and supervisory work.

Inspection Launch. The last major unit of the Dredging Division is the inspection launch used in general supervisory transportation and inspection work.

Electrical Division. The Electrical Division constitutes the first unit under the third of the major groups included in the Department of Operation and Maintenance, and is responsible directly to the Assistant Engineer of Maintenance. It is charged with the installation, operation and maintenance of all power plants, substations, transmission and distribution lines, and lighting, power, telephone, telegraph, and railway signal systems; the operation and maintenance of Gatun Spillway; and all electrical repair and installation work, including work on commercial ships and on floating equipment of other departments and divisions of "The Canal" and railroad. Certain exceptions to these general activities exist, however, such as the lighting, power, and telephone systems at the locks; lighting and power systems at the coaling plants; the electrical installations maintained by the Lighthouse Subdivision of the Marine Division; and such other electrical work as may be specifically assigned to another department or division from time to time.

The Division is headed by an Electrical Engineer, who reports directly to the Assistant Engineer of Maintenance. The work falls under two main and two smaller subdivisions as follows:

1. Power System
2. Construction and Maintenance Section
3. Signal Section
4. Telephone Section

Power System. The Power System is under the administration of a Superintendent of Power, who is responsible directly to the

Electrical Engineer. It includes the Gatun hydroelectric station and the Miraflores steam power plant, the 44,000 volt transmission line, and the substations at Balboa, Cristobal, Gatun, and Miraflores.

Construction and Maintenance Section. The Construction and Maintenance Section is under the direction of a Superintendent, who reports directly to the Electrical Engineer. The Superintendent is charged with the installation, maintenance, and repair of electrical equipment for "The Panama Canal," the railroad, other government departments, and outside interests.[19] The marine electrical work at the Balboa and Cristobal shops of the Mechanical Division is performed by the forces of this section. The work as a whole is divided geographically between the Northern and Southern Districts.

Signal Section. The Signal Section of the Electrical Division is concerned with the operation and maintenance of electrical block signals on the railroad. It is headed by a Supervisor, who reports directly to the Electrical Engineer.

Telephone Section. The Telephone Section of the Electrical Division, like the Signal Section, is under the jurisdiction of a Supervisor, who reports directly to the Electrical Engineer. It cares for the maintenance and operation of all telephones and telegraph apparatus.

Office and Requisitions. The fifth section "Office and Requisitions" as its name indicates performs the general "overhead" work of the Electrical Division. It is headed by an Electrical Recorder, who is responsible directly to the Electrical Engineer.

Municipal Engineering Division. The Municipal Engineering Division, the seventh of the main administrative units, included in the Department of Operation and Maintenance, is under the supervision of the Municipal Engineer, who reports directly to the Assistant Engineer of Maintenance.

It has charge of the construction and maintenance of roads, streets, and sidewalks in the Canal Zone; the construction and maintenance of streets, except cleaning, in the cities of Panama and Colon; the construction, operation, and maintenance of water

[19] The section thus functions, to that extent, as a "business" enterprise as does the Power System on certain phases of supplying current.

and sewer systems in the Canal Zone and in the cities of Panama and Colon; the operation of testing laboratories for the purpose of furnishing analyses and reports on all classes of materials; the operation and maintenance of the garbage incinerator at Mount Hope; and miscellaneous construction and repair work for "The Canal," the railroad, other branches of the government, and individuals and companies.

The duties under the direction of the Municipal Engineer are apportioned among three subdivisions:

1. Southern District
2. Northern District
3. Water Purification Section

Southern District. The Municipal Engineer, in addition to his general responsibilities, acts as superintendent of the Southern District, which extends south of the Chagres River. The work of this district is carried on through five sections or units, three of which are geographical sub-districts:

1. General Engineering Force
2. Repair and Maintenance
3. Ancon-Balboa
4. Pedro Miguel
5. Panama City

Each of these sections or units is under direction of a General Foreman. The General Engineering Force serves for the entire district, as does the Repair and Maintenance unit, which makes repairs to water supply and pump-station equipment.

Northern District. The Northern District, which includes the remaining territory of the Canal Zone, is supervised by a Superintendent and is organized similarly to the Southern District, the geographical subdivisions being Cristobal, Colon and Gatun.

Water Purification Section. The third unit under the Municipal Engineering Division is the Water Purification Section, in the charge of a Director, who is responsible to the Municipal Engineer. It is charged with the operation of the filtration plants and the necessary inspections and analyses to insure the purity of the water supply. The Director is also in charge of the operation of the testing laboratories located at the Miraflores filtration plant, where

chemical analyses, general investigations of road and building materials, and similar laboratory work are carried on.

Lock Operating Division. The Lock Operating Division has charge of the operation and maintenance of the locks. The work is carried on through two sections, the Atlantic Locks and the Pacific Locks, each headed by a Superintendent, directly responsible to the Assistant Engineer of Maintenance, and aided by an Assistant Superintendent.

The Atlantic Locks include the maintenance and operation of Gatun Locks, and the Pacific, include Pedro Miguel and Miraflores. In addition the Superintendent of the Pacific Locks has under his charge the storehouse at Corozal, where supplies and material peculiar to the locks and not used in other "Canal" divisions are kept and issued as needed.

The permanent lock organization is as follows, though the silver roll force is subject to slight fluctuations from time to time:

Gold force	Atlantic Locks	Pacific Locks
Superintendent	1	1
Assistant Superintendent	1	1
Supervisor, Mechanical	1	2
Supervisor, Electrical	1	2
Lockmaster, Senior	2	4
Lockmaster, Junior	4	2
Senior Locomotive Operator	2	4
Tunnel Operator	6	14
Senior Control House Operator	1	2
Junior Control House Operator	6	12
Towing Locomotive Operator	44	70
Foreman, Utility	...	2
Foreman, General	1	...
Foreman, Painter	1	1
Foreman, Material	...	1
Foreman, Carpenter	...	1
Clerk	3	3
Telephone Operator	2	...
Totals	76	122
Silver force		
General labor	189	320
Total permanent force	265	442

While the titles in the tabulation above are for the most part sufficiently descriptive of the duties performed, certain of them

may be amplified for purposes of clarity. The lockmasters represent the locks in the transiting of ships. They follow the lockage from the lock wall and are in telephonic communication with the control house. The lockmaster deals with the pilot who is in charge of the ship, and each issues all orders necessary to accomplish the lockage: the lockmaster to the lock forces and the pilot to the ship's forces. The tunnel operators are stationed in the machinery tunnels during lockages, their duty being to observe that machines which must operate during the lockage function properly. The senior locomotive operators are responsible for the maintenance and repair of the towing locomotives. The towing locomotive operators, who constitute the largest numerical part of the gold force at the locks, include approximately equal numbers of men qualified as electricians and as machinists, thus being available for maintenance work when not needed for operation. Certain other trades are also represented among the locomotive operators, such as divers, crane operators, boiler makers, blacksmiths, cable splicers, and carpenters.

Section of Surveys. The Section of Surveys conducts the following work: maintenance of the precise level bench marks, triangulation stations and Canal Zone boundary monuments, including the 100-foot contour monuments around Gatun Lake; surveys and maps for the various departments and divisions of "The Canal" and the railroad; and periodic measurements on the Gatun Dam, south approach wall of Gatun Locks, Caño Saddle, and the docks. In addition it conducts examinations for the Recorder, Surveyor, and Junior Engineer as required.

It is headed by an Assistant Engineer, who reports directly to the Assistant Engineer of Maintenance. Under him are two junior engineers, a junior engineer-surveyor, two surveyors, a recorder, and twenty silver employees.

Section of Office Engineer. The Office Engineer reports to the Assistant Engineer of Maintenance. His section has charge of the preparation of designs and record drawings for new structures for the Municipal Engineering, Electrical and Lock Operating divisions; miscellaneous drafting work for divisions having headquarters in the Administration Building at Balboa Heights; preparation of specifications and requisitions for the material and equip-

ment of the Lock Operating Division; and maintenance of records of spare material for the locks in the Balboa and Corozal storehouses.

The work includes electrical, structural, architectural and topographical design and drafting, as well as the incidental clerical work. The organization of this section includes an assistant engineer (electrical design), an architect (building design), an engineer designer (structural design), a field engineer, a junior engineer (estimates and records), twelve draftsmen, and four other employees.

Section of Meteorology and Hydrography. The Section of Meteorology and Hydrography is directed by the Chief Hydrographer, who reports to the Assistant Engineer of Maintenance. This section has charge of the records and studies of the climatological, seismological, and hydrographical features of the Canal Zone and vicinity, makes nautical instrument ratings, and sells and distributes charts and other nautical publications. In addition to the work in the Canal Zone, this section, in coöperation with the Navy Department and shipping interests, collects and disseminates hydrographic information relating to the sea areas off both canal entrances.

The records maintained include precipitation, air-temperature, winds, atmospheric pressure, relative humidity, cloudiness, evaporation, fogs, water temperature, general hydrography, seismology, and tides.

Section of Gatun Dam and Backfill. The Section of Gatun Dam and Backfill is charged with the maintenance of Gatun Dam, Caño Saddle, the dikes and Mindee Levee below the spillway, and the backfills at Gatun Locks. Its work consists principally of filling with various materials at points of excavation, erosion, or settlement. The section is supervised by a General Foreman, who is directly responsible to the Assistant Engineer of Maintenance.

Executive Department. The Executive Department constitutes the second of the six major administrative units into which the organization of "The Panama Canal" is divided. It is headed by the Governor and, in effect, constitutes his general business and governmental office. The Governor employs the services of a private secretary, but administers the affairs of the Department through the Executive Secretary, and in an indirect fashion,

through the courts, the United States Marshal, and the District Attorney.

The general organization of the Department, thus, is composed of three major groups, which may be designated as:

1. General Administration
2. Governmental
3. Courts and Court Officers

The governmental group is composed of three divisions: Civil Affairs, Police and Fire and Schools.

All of these groups report through the Executive Secretary to the Governor, the former acting in a more immediate administrative capacity for the first than for the two latter.

Executive Office. The Executive Office, with headquarters at Balboa Heights, is under the direct supervision of the Executive Secretary, who is assisted by a Chief Clerk. The responsibilities of the Executive Secretary, which, by delegation, also apply to the Chief Clerk, are as follows:

> There shall be an Executive Secretary who, under the direction of the Governor of the Panama Canal, shall be charged with the supervision of all matters relating to the keeping of time of employees; to postoffices, customs, taxes and excises, excepting the collection thereof; police and prisons; fire protection; land office; schools, clubs and law library; the custody of files and records; and the administration of estates of deceased and insane employees. He shall, in person or through one of his assistants, perform the duties of a Shipping Commissioner. He shall conduct all correspondence and communications between the authorities of the Canal Zone and the Government of the Republic of Panama and such other correspondence as may be given him in charge by the Governor. He shall have charge of the seal of the Government of the Canal Zone and shall attest such acts of the Government as are required by law to be performed and done under the seal.[20]

The Office is charged with maintaining the files, records and libraries of "The Panama Canal"; all matters relating to the personnel of "The Panama Canal"; the maintenance and supervision of property accounting for all departments of "The Canal"

[20] Executive order, January 27, 1914 (No. 1885).

and the railroad (except a few of the divisions with offices in the field), and the surveying of obsolete and wornout equipment; the compilation of data for wage adjustments, mortality statistics, and shipping statistics; the dissemination of information of a general nature concerning "The Canal"; the publication of rules and regulations; the operation of clubs and playgrounds; and the general office business of the Governor. A large part of the office work is necessitated by the maintenance of centralized record, property, personnel, stenographic, and general clerical services for the several departments and divisions with headquarters in the Administration Building.

To carry on this work the Office is divided into seven bureaus as follows:

1. Correspondence Bureau
2. General Bureau
3. Personnel Bureau
4. Property and Requisition Bureau
5. Record Bureau
6. Bureau of Statistics
7. Bureau of Clubs and Playgrounds

Correspondence Bureau. The Correspondence Bureau, under a Chief, is charged with the stenographic, typewriting, and mimeographing work of all the administrative offices located in the Administration Building. It is also charged with the details in connection with the issuance of American consular visas for alien residents of the Canal Zone and the preparation of various certificates requiring the seal of the Canal Zone.

General Bureau. The General Bureau, under the direction of the Executive Secretary and Chief Clerk, performs miscellaneous work of a specialized character which does not properly form part of the functions of any of the other bureaus. The personnel includes the Surveying Officer and his assistant, who inspect, survey, and make recommendations to the Governor relative to the disposition of obsolete, surplus, and unserviceable equipment, property, material, and supplies, and who supervise the disposition of whatever may be authorized for destruction. They investigate and make recommendations concerning property shortages and irregularities, handle the loan or rental of equipment, and appraise material, equipment, and property for sale or transfer between departments. The

Surveying Officer is chairman of the Board of Appraisal and the Board on Destruction of Useless Records.[21]

This Bureau also includes a supervising roll keeper and two assistants, a cable code clerk and an assistant, an official photographer, an information clerk, and two inspectors who conduct private investigations concerning labor conditions, grievances, irregularities, and other matters requiring administrative action.

Personnel Bureau. The Personnel Bureau, headed by a Chief, handles all matters pertaining to the employment and service of the gold employees of "The Canal" and railroad on the Isthmus, for which it maintains the personnel files and outline of organization. This involves correspondence and clerical work in connection with applications for employment, appointment, changes in salaries and designations, classification and retirement of employees, leaves of absence and transportation, as well as citizenship and naturalization matters.

Property and Requisition Bureau. The Property and Requisition Bureau, headed by a Chief, maintains and supervises the property accounting of all the departments and divisions of "The Canal" and railroad on the Isthmus except a few of the divisions with offices in the field which are subject to such supervision on request. In addition the Bureau prepares and handles requisitions, expendable invoices, etc., and conducts correspondence pertaining thereto.

Record Bureau. The Record Bureau, headed by a Chief, maintains the current files and permanent records of "The Panama Canal" and the railroad and has charge of the accumulation and classification of records turned in by the field offices. In addition it is responsible for the publication of all rules and regulations, rates, circulars, etc.; the custody of documents, publications, and timekeeping records; the indexing and recording of engineering records, including maps, drawings, and photographs; the receipt, distribution, and dispatch of correspondence and official mail for all offices in the Administration Building except the Accounting Department; and the furnishing of messenger service for the

[21] The latter is composed of the Surveying Officer, a representative from the Accounting Department, and an engineer, who investigate and recommend to the Governor for destruction or other disposal, any records which have no permanent or historical value and which may be destroyed under authority of Section 5 of the act of August 24, 1912.

entire building. The Bureau is also charged with the operation of the Canal Zone library system, which maintains a central library in the Administration Building with about 30,000 volumes and small branches in all of the clubhouses, where part-time attendants under supervision of the central library are employed. They are, however, on the payroll of the Bureau of Clubs and Playgrounds.

Bureau of Statistics. The Bureau of Statistics is charged with the compilation of data for wage adjustments, vital statistics for the Chief Health Officer, and shipping statistics, and performs secretarial service for the boards concerned with wages and conditions of employment. It also compiles and disseminates information of a general nature concerning " The Canal " through the Canal Record, pamphlets, the press or otherwise. The Bureau makes special studies of canal services for publication or in answer to inquiries and investigations for furnishing data on various matters which may be the subject of administrative or congressional inquiry. It compiles the monthly and annual reports of the Governor to the Secretary of War.

Bureau of Clubs and Playgrounds. The Bureau of Clubs and Playgrounds is headed by a General Secretary, assisted by a Business Secretary. It furnishes entertainment and recreation for " Panama Canal " employees and their families through the agency of clubhouses, which provide indoor games, moving pictures, and refreshments, and of outdoor playgrounds, athletic fields and swimming pools. Such centers are located as follows:

Gold	Silver
Ancon	Cristobal
Balboa	Gatun
Cristobal	La Boca
Gatun	Paraiso
Pedro Miguel	Red Tank

Division of Civil Affairs. The Division of Civil Affairs, first of the units here designated as " governmental," is directed by a Chief, who is charged with the administration of the customs service of the Canal Zone, the issuance of all licenses and permits except those issued by the Board of Local Inspectors and the Police and Fire Division, the administration and enforcement of the Chinese Exclusion Act, and the administration of the laws

relating to the transaction of business in the Canal Zone by insurance companies and other foreign corporations. The Division also handles other matters pertaining to the civil government of the Canal Zone upon direction of the Executive Secretary.

Office of Chief. The Office of the Chief of Division, in addition to the general administration of divisional affairs, handles for the Executive Secretary all correspondence relating to the conduct of business by insurance companies and other corporations in the Canal Zone and compiles annual reports and statistics relating to them. The remaining activities of the Division are allotted among five administrative subdivisions:

1. Office of Shipping Commissioner
2. Bureau of Customs
3. Bureau of Posts
4. Licenses and Tax Office
5. Administration of Estates

Shipping Commissioner. The Office of Shipping Commissioner, an arbitrary title to designate the group of duties and employees engaged in the work described below, is headed by the Chief of the Division of Civil Affairs in his capacity as Shipping Commissioner. The Chief Customs Inspectors act as deputy shipping commissioners. The scope of activity of the Commissioner and his deputies is as follows:

The Shipping Commissioner and his deputies supervise the signing on and signing off of all American seamen (*i. e.,* seamen on American vessels) engaged or discharged in the Canal Zone, including the payment of the wages of such seamen, the approval of allotments, deductions, fines, and claims for overtime; receive wages of deceased and deserting seamen for deposit and proper disposition according to law; procure seamen for vessels at Canal Zone ports; discharge for hospital treatment sick and injured seamen and attend to their maintenance and return to the United States after their discharge from the hospital; maintain and return to the United States destitute American seamen found in the Canal Zone and also those sent to the Canal Zone by American consuls for shipment to the United States; take charge of the wages and effects of deceased seamen and make disposition thereof according to law; keep a register of the names and characters of seamen; supervise the operation of the seamen's institutes which are conducted by the Salvation Army at Balboa and Cristobal, and arrange for the care and subsistence of seamen at these institutions; inspect the log books, crew lists, and shipping articles of

vessels to see that the provisions of law have been carried out; prepare shipping articles and extend and amend them; investigate complaints of seamen against the officers of vessels and of officers of vessels against seamen: and arbitrate disputes and disagreement with regard to the provisioning of vessels, conditions of employment, treatment, wages, advances and allotments, conduct of seamen, and all other differences between officers and seamen which may arise.[22]

Bureau of Customs. The Chief of the Division heads the Bureau of Customs. He is aided by two Chief Customs Inspectors. The Bureau has custody of merchandise discharged for persons or firms in the Republic of Panama not connected with "The Panama Canal," the railroad, Army, or Navy, until the duty is paid, and it issues permits for the release of such goods. It approves requests for free entry, arrests violators of customs regulations, and certifies invoices covering shipments of goods from the Canal Zone to the United States. It also inspects and seals miscellaneous household goods which have been in use and are to be shipped to the United States. These general functions are exercised through two customs houses, one at Cristobal and the other at Balboa.

The Bureau of Customs also exercises the authority normally lodged with the Immigration Service with regard to the exclusion of the Chinese. All Chinese crew lists are checked, the Chief of the Division being charged directly with the responsibility for Chinese exclusion administration. The Bureau likewise supervises the work of preventing opium and liquor smuggling.

Bureau of Posts. The Chief of the Division of Civil Affairs is ex-officio Director of Posts. This Bureau transacts the business of the Canal Zone postal system and that between the Zone and other postal systems, and in addition is responsible for United States and foreign mail in transit across the Isthmus.

The work of the Bureau is conducted through thirteen post offices located as follows:

Ancon	Cristobal	France Field
Balboa	Culebra	Gamboa
Balboa Heights	Fort Clayton	Gatun
Coco Solo	Fort Sherman	Pedro Miguel
Corozal		

[22] Governor, Annual Report, 1920, p. 266.

Each office is under the direction of a postmaster and all types of activities carried on in United States post offices are conducted also in the Zone system. At the three largest offices, Cristobal, Ancon, and Balboa, assistant postmasters are provided.

License and Tax Office. The License and Tax Office, directed by the Chief of Division, supervises the issuance of permits and licenses, the collection of fees relating to motor vehicles, bicycles, and food-peddlers, and all other licenses and permits not issued by the Board of Local Inspectors or the Police and Fire Division.

Administrator of Estates. The Chief of Division acts as administrator of the estates of deceased and insane "Canal" employees, where no regular administration has been instituted.

Police and Fire Division. The Police and Fire Division is headed by a Chief, who is directly responsible to the Executive Secretary. The Division is charged with the protection of life and property, the maintenance of peace and order, the control of penal institutions and the custody of inmates, the regulation of traffic, the issuance of certain permits and licenses, and the duties normally falling to a coroner's office. It is organized with two sections, the Police Section and the Fire Section, while certain duties inhere to the Office of the Chief.

Division Office. The Division Office, headed by the Chief, in addition to general administration of the police and fire departments, supervises the penal institutions. The Chief is warden of the penitentiary and keeper of the common jails, and as such is responsible for the care and custody of prisoners and convicts. He also acts as coroner.

The Office also arranges for the examination of chauffeurs and the issuance of chauffeurs' licenses, and issues hunting and firearm permits.

Police Section. The Police Section is headed by a Police Inspector, who has under his supervision three captains, five lieutenants, fifteen sergeants, 108 first-class policemen, forty-six policemen (silver), and two boatmen.

The personnel is divided as follows:

1. Headquarters	2
Detective force	7
2. Balboa Central Station	39
Ancon	23
Pedro Miguel	16
San Juan	4

3. Cristobal Central Station	44
Gamboa	3
Gatun	16
Monte Lirio	1
4. Penitentiary	22

This section performs the usual work of a municipal police department, including harbor policing, and in addition performs highway patrol, prohibition enforcement, and other duties less usual to a metropolitan force.

Fire Section. The Fire Section is headed by an Inspector. The paid personnel includes two captains, six lieutenants, four sergeants, one motor inspector, and thirty-two firemen, while the volunteer force consists of 197 men. The duties are those usual to a municipal fire department.

The distribution of personnel and organization of the section is as follows:

Location	Paid	Volunteer
1. Headquarters	1	...
2. Balboa Central Station	17	...
Corozal House	...	10
Palo Seco House	...	19
1. Pedro Miguel Substation	5	17
Paraiso House	...	8
Tug "Cocoli"	...	30
3. Cristobal Central Station	17	...
1. Gatun Substation	4	17
Gamboa House	...	9
Monte Lirio House	...	2
Frijoles House	...	2
Tug "Porto Bello"	...	30
Tug "Tavernilla"	...	24
	44	168

Division of Schools. The Division of Schools has supervision over all educational affairs in the Canal Zone. At the head of the Division is a Superintendent of Schools, who is responsible to the Executive Secretary.

The Superintendent is charged with the selection and assignment of the teaching force, the government of the schools, the prescription of the courses of instruction, and the general administration of the affairs of the division.

In addition to the Superintendent, the supervisory force consists of two Assistant Superintendents, one of whom serves for

high schools, all colored schools and the upper grades of the white schools, while the other serves for the remaining grades of the white schools. There are no colored high schools. One Supervisor of Penmanship and one Supervisor of Music are also employed.

In addition to the general supervisory officers, certain teachers render services "at large." These consist of a teacher of modern languages at Cristobal High School, who also teaches Spanish in Gatun, two line teachers, and a Spanish teacher on the Pacific side.

The personnel is distributed as follows:

School	Principals[23]	Teachers[24]
WHITE		
1. Balboa High	1	12
2. Cristobal High	1	6
3. Ancon Grade	1	10
4. Balboa Grade	1	20
5. Pedro Miguel Grade	1	4
6. Camp Gaillard Grade	1	3
7. Gatun Grade	1	4
8. Cristobal Grade	1	15
Total	8	74
COLORED		
9. La Boca	1	10
10. Pedro Miguel	1	6
11. Paraiso	1	3
12. Gamboa	1	1
13. Empire	1	3
14. Las Cascadas	1	1
15. Gatun	1	5
16. Cristobal	1	10
Total	8	39
Grand Total	16	113

Courts and Court Officers. The Courts, as here dealt with, include also the District Attorney's and United States Marshal's Offices and hence appear as follows:

1. District Court
2. United States Marshal
3. Magistrate Courts
4. District Attorney

[23] Principal also teaches except in the Balboa and Cristobal grade schools.
[24] Two teachers at each high school also act, respectively, as manual training and household arts instructors.

District Court. The District Court is composed of two divisions, one including Balboa and the other Cristobal. The District Judges are appointed by the President and confirmed by the Senate for a term of four years and thereafter pending the appointment of a successor. The immediate officers of the courts are those attached to similar courts in the United States.

United States Marshal. The United States Marshal is appointed in the same manner as the District Judge and for the same term. He executes all processes of the District Court and preserves order therein.

Magistrate Courts. The Magistrate Courts of the Canal Zone, are located at Balboa and Cristobal. Each court is presided over by a Magistrate, who is appointed by the Governor of "The Panama Canal" for a term of four years and until his successor is appointed and qualified. He must be a citizen of the United States.

District Attorney. The District Attorney, like the District Judge, is appointed by the President, by and with the advice and consent of the Senate for a term of four years and until his successor is appointed and qualified.

He conducts all legal business, civil and criminal, for the Government in the Canal Zone and acts as advisor to the Governor and the heads of departments on legal questions touching the operation of "The Canal" and the administration of civil affairs. He is general prosecutor for the Canal Zone.

Supply Department. The Supply Department constitutes the third of the major administrative units of "The Panama Canal." It is headed by the Chief Quartermaster, who is responsible directly to the Governor.

It is charged with the ordering, storage, and distribution of material and supplies for use of "The Panama Canal" the railroad, and their employees, and for other departments of the government of the Isthmus and their employees; the supplying of vessels of the United States and other vessels when required; the operation of commissaries, hotels, restaurants, messes, pastures, plantations, and farms; the maintenance and construction of buildings; the assignment of quarters and the care of grounds; and the recruiting and distribution of unskilled labor. The Department also has charge of the necessary motor and animal transportation.

Chief Quartermaster's Office. The Chief Quartermasters Office, which exercises administrative control over the Department, is headed by the Chief Quartermaster, who employs a chief clerk, an inspector and a clerk.

The work under this Office, which constitutes the work of the Department, is allocated to six major divisions, as follows:

1. Superintendent
2. Commissary Division
3. Cattle Industry Division
4. Transportation Division
5. Constructing Quartermaster
6. Farms Bureau

Superintendent. The Superintendent, who reports directly to the Chief Quartermaster, has under his supervision four administrative units:

1. Quartermaster Division
2. Storehouses and Fuel Oil Plants
3. Subsistence Section
4. Panama Canal Press

Quartermaster Division. The Quartermaster Division is charged with the assignment and rental of quarters and the care of public buildings and grounds. Its work is divided geographically among three divisions, each under a District Quartermaster, who reports directly to the Superintendent. The work under the three divisions is the same, being differentiated only as to the locality to which it is applied. These divisions are:

1. Balboa
2. Pedro Miguel
3. Cristobal-Gatun

The Cristobal-Gatun District is subdivided into the Cristobal and the Gatun Sections. The former conducts the general supervisory work for the district and also the local service for Cristobal, while the latter directs the service operations at Gatun.

Storehouses and Fuel Oil Plants. The Storehouses and Fuel Oil Plants are under the immediate direction of a General Storekeeper who is responsible to the Superintendent. This unit is charged with the receipt, storage, and sale of equipment, materials, and supplies and the operation of fuel oil pumping plants and oil storage and handling facilities at canal terminals.

The General Storekeeper, in addition to his general administrative duties, has immediate supervision of the Balboa office and storehouse, from the former of which the affairs of the entire unit are administered.

The operations are carried on through seven sub-units, designated as:

1. Balboa Storehouse
2. Cristobal Storehouse
3. Paraiso Storehouse
4. Cristobal Docks
5. Balboa Fuel Oil Plant
6. Mount Hope Fuel Oil Plant
7. Dynamite Magazines

The Balboa storehouse office functions generally as well as locally. This storehouse, the main distribution point for the Canal Zone, includes the medical storehouse. The Cristobal and Paraiso storehouses are similarly organized, each being under the supervision of a storekeeper, who is responsible to the General Storekeeper. The personnel of each storehouse is also divided as to office and general, a similar force being employed at Paraiso. The Cristobal storehouse is a general sub-storage unit under Balboa, except for medical supplies. The Paraiso storehouse, however, is devoted to dredging supplies, materials, and equipment. The Cristobal docks form the receiving, temporary storage, and preliminary inspection point for incoming goods and the final inspection point for materials sold and awaiting shipment. They are under supervision of an Inspector who is responsible to the General Storekeeper. The Balboa and Mount Hope fuel oil plants store and pump fuel oil for " The Canal " and also for outside interests. Each employs a foreman in charge, responsible to the General Storekeeper. The dynamite magazines are utilized for the purpose indicated by the name.

Subsistence Section. The Subsistence Section is charged with general administrative supervision of hotels, restaurants, and messes, and is the third of four subdivisions reporting directly to the Superintendent. The three units operated are:

1. Hotel Tivoli (Ancon)
2. Hotel Washington (Colon)
3. Restaurants and Messes

The hotels are each operated under the immediate direction of resident managers, who are responsible to the Superintendent. The Washington is operated for the account of the railroad. The restaurants and messes are all operated under contract and but nominal supervision is exercised.

Panama Canal Press. The Panama Canal Press prints the Panama Canal Record as well as stationery, forms, etc., for the railroad and "The Canal" and maintains paper and form stocks. The work is under direction of a Printer, who is directly responsible to the Superintendent.

Commissary Division. The Commissary Division is operated for the account of the Panama Railroad by the Supply Department and as a matter of administration is considered under the latter department. It is charged with the ordering, storage, and sale of all food supplies, clothing, and other similar items, and in carrying out these duties it operates an abattoir, two cold storage plants, various manufacturing plants, a laundry, a wholesale warehouse, and retail stores. The Division is headed by a General Manager, who is responsible directly to the Chief Quartermaster. Supervision of the Division activities is carried on through the General Manager's Office, which employs an Assistant General Manager.

The work of the Division is divided among three groups of units known as:

1. Retail Stores
2. Warehouses
3. Manufacturing and Service Plants

Retail Stores. The retail stores include twelve commissaries or stores as follows:

1. Ancon
2. Ancon (silver)
3. Balboa
4. Cristobal
5. Culebra
6. Gamboa
7. Gatun
8. La Boca
9. Monte Lirio
10. Paraiso
11. Pedro Miguel
12. Red Tank

Warehouses. The warehouses which constitute, in effect, wholesale units are five in type and may be designated by commodity as follows:

1. Perishables (cold storage)
2. Groceries
3. Dry goods
4. Shoes
5. Hardware

The cold storage plant at Mount Hope is under direction of a Superintendent, while the dry goods unit is under direction of a buyer for the technical part of the work and a foreman in charge of shipping and other similar activities. The other units are under supervision of general foremen, all being responsible directly to the General Manager.

Manufacturing and Service Plants. The manufacturing and service plants include the following units:

Abattoir	Ice Cream Plant
Bakery	Industrial Laboratory
Canneries	Laundry
Coffee Roasting Plant	Milk Bottling Plant
Ice Plants	Sausage Factory

The industrial laboratory is engaged in the manufacture of fruit syrups, flavoring extracts, pharmaceuticals, and preserves, and in the bottling of soda water, salad oil, vinegar, etc.

Cattle Industry Division. The Cattle Industry Division is headed by a Superintendent, who directs the work of the Division through the Superintendent's Office, the latter being responsible directly to the Chief Quartermaster.

The Division is charged with the operation and maintenance of cattle pastures, plantations, and the dairy farm, and with stock raising and breeding.

The pastures are divided into two groups, East Side and West Side, each managed by a foreman. The East Side pastures are located at Bohio, Caemito, and Summit, while the West Side pastures include Miraflores and Mandingo.

Plantations are maintained at Juan Mina and Frijoles, all others being leased to private interests. The products are tropical fruits, principally alligator pears.

The dairy farm is directed by a veterinarian.

Transportation Division. The Transportation Division is charged with the operation and maintenance of all animal and motor transportation furnished to the departments and divisions of "The Panama Canal" and the Panama Railroad.[25] The service is required to operate on a self-sustaining basis with a view

[25] Except for the operation of motor rail inspection cars, which is placed under the Panama Railroad organization.

to supplying transportation at a minimum cost. The Division is headed by a General Foreman who is responsible directly to the Chief Quartermaster.

The general work of the Division is handled by the main garage and motor car repair shop at Ancon and a large garage with a small repair shop at Cristobal. Transportation and repairs at Pedro Miguel and Gatun are handled as required by the detail of personnel and equipment from other shops and garages.

Motor Car Repair Shops. The motor car repair shops at Ancon and Cristobal care for the maintenance and repair of motor trucks and motor rail inspection cars. They are supervised by a motor car inspector, who reports directly to the Chief Quartermaster, though the shops are placed under the jurisdiction of the Transportation Division. The Division also maintains corrals for draft animals at Ancon and Cristobal.

Constructing Quartermaster Division. The Constructing Quartermaster Division, fifth of the major units directly responsible to the Chief Quartermaster, is supervised by a Constructing Quartermaster. The Division is charged with the construction, maintenance, and repair of buildings for the Panama Railroad and "The Panama Canal," including all quarters on the Isthmus. The Division also conducts new construction and repair work on buildings for the Army and Navy and construction work for outside interests. The type of work done does not duplicate that performed by the Division of Municipal Engineering however.

The work of the Division is divided under two sub-units:

1. General Building Construction
2. Maintenance

General Building Construction. The work of the General Building Construction Section is indicated by the name. It is supervised by a General Foreman reporting to the Chief Quartermaster.

Maintenance. The maintenance force is divided in general geographically, though in part functionally, as follows:

1. Ancon Planing Mill
2. Balboa
3. Cristobal
4. Gatun
5. Pedro Miguel
6. Traveling Gang

Each of these units, except Balboa, is headed by a Foreman who reports to the Constructing Quartermaster. Balboa, under direct supervision of the Constructing Quartermaster, employs five foremen. The Ancon planing mill indicates its function by the name. The work of the four geographical units is similar, involving general repair and maintenance work in the districts indicated. The traveling gang is engaged in repair and maintenance work.

Farms Bureau. The Farms Bureau is directed by an Agronomist, who reports directly to the Chief Quartermaster. The Bureau conducts agricultural extension and plant introduction work in the Canal Zone and experimental work on plantations and also acts in a supervisory and advisory capacity with regard to the latter. Plant introduction gardens are conducted at Summit.

Accounting Department. The Accounting Department as a whole is charged with the direction and control of the accounting, auditing, claim settlement, collecting, and disbursing work for "The Panama Canal" and the Panama Railroad. It is under the supervision of the Auditor, who is directly responsible to the Governor. In addition to his general administrative duties for the Department, the Auditor has immediate supervision of the accounting work on the Isthmus and acts as budget officer for "The Panama Canal."

The work of the Department is allocated to four divisions, which are designated as follows:

1. Office of the Auditor
2. Office of Collector
3. Office of Paymaster
4. Washington Office

Office of the Auditor. The Office of the Auditor in addition to the general supervisory work over the Department, supervises the preparation of estimates for appropriations by Congress and also supervises the allotment of funds appropriated for expenditure by "The Panama Canal." It checks all new rates or changes of rates before they are incorporated in published tariffs and prescribes all forms for recording the receipt and disbursement of moneys and property and all forms necessary for use in accounting for money and property, except as otherwise prescribed in accordance with law.

The Office is charged with other responsibilities which are carried out through the agency of numerous bureaus. These duties include the immediate direction and control of accounting and the auditing and settlement of claims for " The Panama Canal " and the Panama Railroad on the Isthmus, and the supervision and control of acceptance of bonds, the methods of keeping records and accounts of receipts and disbursements of moneys received by all officers and agents of " The Panama Canal " and the Panama Railroad on the Isthmus by virtue of their offices and positions and the methods of safeguarding such moneys.

In addition the Office examines the books, contracts, records, and accounts of money and property in the possession of all officers and agents of " The Panama Canal " and of the Panama Railroad on the Isthmus.

The duties just enumerated are allocated among nine bureaus, designated as follows:

1. General Accounting
2. Auditing
3. Claims
4. Coupon Accounting
5. Time Inspection
6. Property Inspection
7. General Inspection
8. General
9. Panama Railroad Accounting

General Accounting. The General Accounting Bureau constitutes the general accounting and cost keeping office for " The Panama Canal " affairs on the Isthmus. It is directed by a Chief Accountant, the work being divided between two units:

1. General Accounts Section
2. Costkeeping Section

The General Accounts Section, which keeps the general accounts for " The Panama Canal " on the Isthmus is under the direction of an Assistant Chief Accountant.

The Costkeeping Section is engaged in maintaining cost accounts for " The Panama Canal " on the Isthmus. It is headed by a Chief of Section responsible to the Chief Accountant.

Auditing. The Auditing Bureau is charged with the examination and audit of all accounts collectible. It is headed by a Chief Examiner.

The work of the Bureau is divided between two sections:

1. General
2. Tabulation

The General Section is under the immediate direction of the Chief Examiner. In this section the Collector's official abstract is prepared, showing all collections, assembling the accounts from copies of receipts or receipt forms, cash sales, etc., issued by the Collector himself and about seventy other collecting agents. Accounts receivable vouchers of "The Panama Canal" and Panama Railroad are registered and passed for collection and a record kept of the payments as they are made. Payroll deductions from gold employees pay are recorded and a statement prepared for each employee every month showing in detail the amount to be deducted and what it is for. The postal and clubhouse accounts are also kept in this section.

The Tabulation Section is headed by a Chief of Section, who is responsible to the Chief Examiner. It keeps the general storehouse accounts and operates a number of accounting and tabulating machines in connection with the storehouse accounts and accounts receivable.

Claims. The Claims Bureau is charged with the auditing and settlement of claims against the Panama Railroad and "The Panama Canal," including the payrolls. This work is under direction of a Claim Officer. The Bureau is divided into two sections:

1. General
2. Payrolls

The General Section is under the immediate direction of the Claim Officer, and handles Panama Railroad and "Panama Canal" accounts payable vouchers, injury claims, freight claims, and payroll collections from silver employees.

The Payroll Section is directed by a Chief of Section, who reports to the Claim Officer. It examines and validates all payrolls, time vouchers, and pay receipts for employees of the "Panama Canal" and Panama Railroad prior to submitting them to

the Paymaster for payment, and checks and keeps a record of payroll deductions, vacation time, and retirement funds.

Coupon Accounting. The Coupon Accounting Bureau is engaged in the handling of and accounting work concerned with Commissary Division purchase coupons. It is conducted under the supervision of a Chief of Section.

Time Inspection. The Time Inspection Bureau is headed by a Chief Time Inspector. Its work consists of checking the employees of "The Panama Canal" and Panama Railroad on the work as to time and rate of pay against the time books, seeing that the employees are actually at work, correcting errors and reporting irregularities in time keeping and instructing time keepers as to the proper methods to be used in keeping time, showing rates of pay, etc. This Bureau also investigates the misuse of commissary coupon books and railroad transportation and any other irregularities that come to its notice.

Property Inspection. The Property Inspection Bureau is headed by a Chief Property Inspector, whose duty it is to see that all of the material and property of "The Panama Canal" and Panama Railroad Company are properly protected and cared for and that records of all receipts and disbursements of material and property and records of all property in use, as well as records of material and property carried in stock in the various storehouses, are correctly maintained. It carries on a continuous inventory system.

General Inspection. The General Inspection Bureau consists of a number of travelling inspectors supervised by a Chief Inspector, their duties being to make periodic inspections of the accounts of the Paymaster, Collector, and all other fiscal officers who have to do with the collecting and disbursing of funds of the Panama Railroad and "Panama Canal," together with the transfer of accounts from one cashier to another continuously during the year as employees go on vacation or leave the service.

General. The General Bureau attends to the bonding, mailing, filing, and addressograph work of the Department on the Isthmus. It is supervised by a Chief of Section.

Panama Railroad Accounting. The Panama Railroad accounting includes the railroad accounts on the Isthmus. It is headed by a Railroad Accountant.

The work of the Bureau is divided among two sections:

1. General Section
2. Commissary Accounts Section

The General Section keeps the general accounts, the station accounts, cost accounts, and statistics, including accounts for harbor terminal operations, baggage transfer service, municipal stables, telephones, real estate, hotel operations, plantations, coal, cattle industry, and dairy. The work is supervised by an Assistant Railroad Accountant.

The Commissary Accounts Section handles the general and the cost accounts of the wholesale and retail commissary operations. The Section is headed by the Commissary Accountant, who reports directly to the Railroad Accountant.

Office of Collector. The Officer of Collector is charged with the collection and receipt of all moneys due "The Panama Canal" and the Panama Railroad Company on the Isthmus. It is directed by the Collector who, for organization purposes, reports to the Auditor. The supervision of the Auditor over this office is nominal however.

The Office has custody of currency, postal savings, money orders, clubhouse and other trust and security funds for the purpose of transfer and forwarding and also, upon requisition approved by the Auditor, has custody and authority for the issue of coupon books, refund notes, railroad tickets, stamps, and similar money equivalents.

The work of the Office is divided among three sub-units:

1. Main Office
2. Cristobal Office
3. Panama Office

The Main Office, at Balboa, conducts the general supervisory work of the unit in addition to local collections and is under the immediate supervision of the Collector.

The Cristobal Office is supervised by a Deputy Collector, as is the Panama Office.

Office of Paymaster. The Office of Paymaster is charged with the payment on the Isthmus of all moneys for the account of "The Panama Canal" and the Panama Railroad, expendable un-

der the direction of the Governor. It is under the supervision of a Paymaster, who, like the Collector, is directed nominally by the Auditor, but who, in fact, exercises a large degree of independence.

The work is divided between two sections designated as:

1. Main Office
2. Cristobal Office

The Main Office conducts the general supervision of the entire unit as well as the local disbursement work, while the Cristobal Office employs a paying teller and the necessary assistants.

Accounts in Washington. The Washington Office of the Accounting Department is only remotely supervised by the Auditor and hence, while here mentioned, is described below in detail more properly as a unit under a major department.

Washington Office. While for the purpose of general organization plan designation, the functions of "The Panama Canal" carried on at Washington, D. C., are included under the term "Purchasing Department," a more accurate title is "Washington Office," since three types of work are conducted therein.[26] The term "Washington Office" is, hence, used in this description.

The Washington Office is charged with purchasing supplies, material, and equipment for "The Panama Canal," the recruiting of all personnel for employment except silver labor, accounting work for United States operations, and general executive and administrative duties as representative of the Governor in the United States. It is supervised by the General Purchasing Officer, who also acts as Chief of the Washington Office of "The Panama Canal" and who is directly responsible to the Governor. The General Purchasing Officer has a dual function therefore, acting as general purchasing officer in purchasing matters and Chief of Office in general administration matters.

The work is divided among three units designated as follows:

1. Purchasing Department
2. Accounting Department
3. Administrative Department

Purchasing Department. The Purchasing Department is headed by the General Purchasing Officer, who is assisted by a

[26] For variation in use of these titles, see Annual Report of the Governor, 1921, pp. 56 and 80.

Chief Clerk. The Department is charged with the general purchasing activities of "The Canal" and in addition handles the sales in the United States of obsolete "Canal" material and equipment.

These duties are carried on through the agency of four sections or units:

1. Inspecting Engineer
2. Assistant Purchasing Agent (New York)
3. Assistant Purchasing Agent (New Orleans)
4. Medical Section, General Intermediate Depot (New York)

Inspecting Engineer. The Inspecting Engineer's Office has supervision over the inspection and testing of material and supplies purchased. A preliminary inspection system is maintained by means of a force of inspectors located at various points throughout the United States, supplemented by assistance from other government departments as occasion may require.

The Office is headed by an Inspecting Engineer, who is under the supervision of the General Purchasing Officer. Five clerks are employed in the office and twenty inspectors in the field.

Assistant Purchasing Agents. Assistant Purchasing Agents' Offices are located at New York and New Orleans, a lump sum being paid by "The Canal" to the Panama Railroad for such services as are rendered. These officers also act as receiving and forwarding agents for materials which have been purchased for forwarding to the Isthmus, through their respective ports.

The duties at the two points mentioned are the same, the only variation being in location. The Agents report immediately to the General Purchasing Officer.

Medical Section, New York General Intermediate Depot. The Medical Section is under the War Department, an officer of the Medical Corps of the United States Army being in charge. It purchases such medical and hospital supplies for use of "The Canal" on the Isthmus as requested from time to time by the General Purchasing Officer, the preponderance of such supplies being purchased through that depot. "The Panama Canal" furnishes two employees to augment the force of the Section, as compensation for the work done for "The Canal."

General. Assistance in the preparation of specifications, and in testing and general purchasing operations is rendered through

coöperative arrangements with field officers of the Corps of Engineers, the Bureau of Standards, the Bureau of Mines, the Bureau of Chemistry, and the Medical Department of the United States Army.

The General Purchasing Officer, Chief Clerk, and Inspecting Engineer serve on various committees and boards appointed by the Chief Coördinator and concerned with purchase and sale methods and policies, contracts, specifications, etc.

Accounting Department. The Accounting Department of the Washington Office is headed by the Assistant Auditor and Legal Advisor, who is responsible directly to the General Purchasing Officer and Chief of Office. The Auditor of "The Panama Canal" also exercises a remote supervision over this Department and the Assistant Auditor. It is rather a coöperative than a directional relation, however.

This Department prepares all vouchers for payments to be made in the Washington Office; keeps all records relative to payments and financial transactions; conducts correspondence relative to payment of claims; has charge of collections; examines and approves transfer settlements; gives disbursing clerks accounts an administrative examination before they are submitted to the General Accounting Office; prepares statistical data required to show distribution of expenses of the Washington Office; prepares reports on all claims submitted to the General Accounting Office for settlement; prepares all contracts and bonds; has charge of all work connected with deposits for tolls made with the Treasurer of the United States and Federal Reserve Banks, and passes on all legal questions involved in the transaction of the business of the Washington Office of "The Canal." The Assistant Auditor and Legal Advisor represents "The Canal" on the Interdepartmental Board of Contracts and Adjustments.

Disbursing Clerk. The Disbursing Clerk has supervision over disbursements in the Washington Office. He bears a dual responsibility, being supervised by both the General Purchasing Officer and the Assistant Auditor and Legal Advisor.

Administrative Department. The Administrative Department of the Washington Office is charged with the general details of administration of the work in Washington. It is under the direction of the Chief of Office, who is aided by the Assistant Chief of

Office. Its work is divided among four administrative units known as:

1. Appointment Division
2. Correspondence and Record Division
3. Draftsman
4. Miscellaneous

Appointment Division. The Appointment Division has charge of the selection of employees for "The Panama Canal"[27] to be utilized either on the Isthmus or in the Washington Office. It selects from the list of eligibles of the Civil Service Commission roster such employees as are required and must, by order, be chosen in that manner. It also is charged with the direct selection of applicants to fill vacancies in cases where the positions do not require Civil Service list eligibles, and with transfers from other government departments.

The division maintains a file of applicants for employment, waiting lists of approved applicants for the various positions on the Isthmus above the grade of skilled laborer, a record of vacancies in process of filling and a card service record system of all employees of the Washington Office and of all employees on the Isthmus above the grade of unskilled laborer, that is the "Gold Roll" employees of "The Panama Canal" and Panama Railroad Company.

The Division is headed by Chief of Division, who is directly responsible to the Assistant to the Chief of Office.

Correspondence and Record Division. The Correspondence and Record Division is charged with all general or administrative correspondence, including the furnishing of statistics, particularly in connection with traffic through the canal, the recording and filing of correspondence and records, the coding and decoding of cable messages, and miscellaneous duties of a clerical and custodial nature. It is immediately under the supervision of the Assistant to the Chief of Office.

Draftsman. The Draftsman performs services for both Purchasing and Administrative Departments.

Miscellaneous. The Miscellaneous Section is under the immediate direction of the Assistant to the Chief of Office and includes a property and shipping clerk, a clerk, and necessary messengers.

[27] Except minor grade positions and unskilled labor on the Isthmus.

Health Department. The Health Department constitutes the last of the main departments into which the organization of "The Panama Canal" is divided. It is headed by a Chief Health Officer, who is directly responsible to the Governor.

This Department has jurisdiction over all matters relating to maritime sanitation and quarantine in the ports and waters of the Canal Zone and in the harbors of the cities of Colon and Panama, and land sanitation in the Canal Zone; also sanitary matters in the cities mentioned,[28] and all matters relating to hospitals and charities.

The general administration of the Department is conducted from the Chief Health Office at Balboa Heights, which includes the Chief Health Officer, the Assistant Chief Health Officer, and an office assistant.

The work of the Department is conducted by three major divisions, namely:

1. Hospitals and Charities
2. Sanitation
3. Quarantine

Hospitals and Charities. The Division of Hospitals and Charities is charged with institutional and dispensary administration. The program is carried on through five units or organizations, as follows:

1. Ancon Hospital
2. Corozal Hospital
3. Colon Hospital
4. Palo Seco Leper Colony
5. Dispensaries

The Division is under the direct supervision of the Chief Health Officer.

Ancon Hospital. The Ancon Hospital unit also includes the Board of Health Laboratory, connected therewith for administrative and technical convenience.

The Hospital is under supervision of a Superintendent aided by an Assistant to the Superintendent.

[28] In conformity with the Canal Treaty between the United States and the Republic of Panama and agreements thereunder.

The technical work is divided among five clinics.

1. Surgical
2. Medical
3. Eye, Ear, Nose, and Throat
4. X-Ray
5. Radio-therapeutic

Each of these clinics is directed by a Chief who, except in the case of the last named clinic, is aided by an Assistant Chief. The staff in addition includes Army physicians and internes.

The Board of Health Laboratory is also under the direct control of the Chief Health Officer. The immediate work is supervised by the Chief of Laboratory, who is assisted by an Army pathologist, an Army bacteriologist, and a civilian chemist. In addition to general laboratory and bacteriological work, swimming pool water is tested and embalming and cremation are performed.

Corozal Hospital. Corozal Hospital for the Insane is managed by a Superintendent, who is responsible to the Chief Health Officer. The staff includes, also, one civilian and one Army physician.

In addition to the usual asylum activities a farm department is maintained on which indigent cripples are employed in agriculture, dairying, and pig breeding.

Colon Hospital. Colon Hospital, like Corozal, is managed by a Superintendent, under the direction of the Chief Health Officer. The staff includes, in addition, one civilian and four Army physicians.

Palo Seco Leper Colony. The function of the Palo Seco Leper Colony is the isolation and treatment of lepers. It is directed by a Superintendent responsible directly to the Assistant Chief Health Officer. An attending physician is also employed.

Dispensaries. Dispensaries are maintained at the following points:

1. Colon Hospital
2. Gatun
3. Pedro Miguel
4. Ancon Hospital
5. Balboa

Each of these dispensaries is managed by a District Physician, who reports to the Chief Health Officer. There are in addition, two physicians at Balboa and one each at Pedro Miguel and Ancon.

Division of Sanitation. The Division of Sanitation is charged with the administration of sanitation measures in the Canal Zone and with the enforcement of sanitary rules and regulations of the cities of Colon and Panama. It is under the direct supervision of the Chief Health Officer.

The work of sanitation is allocated under three administrative units designated as follows:

1. Division of Zone Sanitation
2. Panama Health Office
3. Cristobal-Colon Health Office

Zone Sanitation. The Division of Zone Sanitation is under the direct charge of the Assistant Chief Health Officer. It has management and control over all work performed or entered upon within the Canal Zone for the prevention or suppression of diseases, and is charged with the duty of securing the enforcement of all sanitary regulations and performing such other duties as may be required by the Chief Health Officer or the Governor of "The Panama Canal."

For purposes of administration the Canal Zone is divided into sanitary districts which are as follows:

1. Northern
2. Southern
3. Ancon-Balboa

The office of the first district is at Gatun and of the other two at Ancon, each District being supervised by a Sanitary Inspector. A Relief Sanitary Inspector is stationed at Pedro Miguel.

Panama Health Office. The Panama Health Office is directed by the Health Officer of the City of Panama, who reports directly to the Chief Health Officer. It is charged with the enforcement of sanitary rules and regulations and performs such duties as may be prescribed by law and such other duties as may be required by the Chief Health Officer or the Governor of "The Panama Canal."

This Office in addition to the Health Officer, employs a Chief Veterinarian and Meat Inspector, four Sanitary Inspectors, and one Vaccinator.

Cristobal-Colon Health Office. The Cristobal-Colon Health Office is organized and supervised in the same manner, and charged with the same duties, as the Panama Health Office. The

only difference lies in the territory over which it has jurisdiction. This territory for the Cristobal-Colon Office extends to and includes the municipality of Cristobal, in the Canal Zone, and such areas in the vicinity thereof as are assigned by the Chief Health Officer.

In addition to the Health Officer the Office employs two Sanitary Inspectors, and two Veterinarians and Meat Inspectors.

Division of Quarantine. The Division of Quarantine is headed by the Chief Quarantine Officer, who is detailed from the United States Public Health Service, and reports to the Chief Health Officer. It is responsible for the sanitation of the harbors and vessels lying therein and the enforcement of such measures as are necessary for the proper hygiene of vessels, cargoes, and personnel, whether in port or *en route,* and the prevention of such vessels becoming a source of danger to other vessels or to the port. The Division is authorized to certify to bills of health of vessels clearing from ports under its jurisdiction, setting forth in such bill of health the condition of the port, vessel, cargo, passengers, and crew. At the request of the master of any vessel, it is authorized to disinfect and otherwise place such vessel in a sanitary condition so that it may leave the port in free pratique and be able to make entry at the port of destination without further disinfection or detention in quarantine. Finally, the Division may prevent the entry into the Canal Zone of any person whose presence would be a menace to the public health, or welfare, or who would be likely to become a charge upon the public.

The general administrative and technical work of the Division is carried on at the Chief Quarantine Office, Balboa Heights. The detailed duties are divided between two stations:

1. Cristobal-Colon Quarantine (Cristobal)
2. Balboa-Panama Quarantine (Balboa)

Cristobal-Colon. The Cristobal-Colon Quarantine Station is supervised by a Quarantine Officer who reports to the Chief Quarantine Officer. A staff of three physicians is employed in addition to the Quarantine Officer.

Balboa-Panama. The Balboa-Panama Quarantine Station is organized and supervised in the same manner as Cristobal-Colon. The staff in addition to the Quarantine Officer consists of two physicians.

APPENDIX 1

OUTLINE OF ORGANIZATION

Explanatory Note

The purpose of Outlines of Organization in this series of Monographs is to show in detail the organization and personnel of the several services of the national government to which they relate. They have been prepared in accordance with the plan followed by the President's Commission on Economy and Efficiency in its outlines of the organization of the United States government.[1] They differ from those outlines, however, in that whereas the Commission's report showed only organization units, the presentation herein has been carried far enough to show the personnel embraced in each organization unit.

These outlines are of value not merely as an effective means of making known the organization of the several services. If kept revised to date, they constitute exceedingly important tools of administration. They permit the directing personnel to see at a glance the organization and personnel at their disposal. They establish definitely the line of administrative authority and enable each employee to know his place in the system. They furnish the essential basis of plans for determining costs by organization division and subdivision. They afford the data for a consideration of the problem of classifying and standardizing personnel and compensation. Collectively they make it possible to determine the number and location of organization units of any particular kind, such as, laboratories, libraries, blue-print rooms, or other plants, to what services attached and where located, or to determine what services are maintaining stations at any city or point in the United States. The Institute hopes that upon the completion of the present series, it will be able to prepare a complete classified statement of the technical and other facilities at the

[1] 62 Cong., H. doc. 458, 1912, 2 vols.

disposal of the government. The present monographs will then furnish the details regarding the organization, equipment, and work of the institution so listed and classified.

OUTLINE OF ORGANIZATION

THE PANAMA CANAL

SCHEDULE I. CANAL ZONE OFFICES

PART I. GOLD ROLL EMPLOYEES

October 1, 1925

Units of Organization: *Classes of Employees*	*Number*	*Annual Salary Rate*
1. General Administration		
1. Office of Governor		
1. Office proper of Governor		
Governor	1	$10,000.00
Secretary to the Governor	1	3,800.00
Member, Wage and Grievance Board	1	2,676.00
2. Office of Engineer of Maintenance		
Engineer of Maintenance	1	7,500.00
Office Assistant	1	3,500.00
3. Office of Assistant Engineer of Maintenance		
Assistant Engineer of Maintenance	1	6,000.00
Assistant to Engineer of Maintenance	1	3,300.00
Office Assistant	1	3,200.00
2. Department of Operation and Maintenance		
1. Marine Division		
Marine Superintendent	1	7,000.00
Captain of the Port (Cristobal)	1	5,800.00
Assistant Captain of the Port (Cristobal)	1	5,100.00
Captain of the Port (Balboa)	1	5,800.00
Assistant Captain of the Port (Balboa)	1	5,100.00
Supervisor of Harbor Craft	1	4,800.00
Assistant Supervisor of Harbor Craft	1	2,822.40
Harbormaster (Cristobal)	1	4,500.00
(Balboa)	1	4,500.00
Assistant Harbormaster (Balboa)	1	3,300.00
Inspector of Hulls and Boilers	1	3,780.00
Office Assistant	1	3,300.00

Admeasurer (Chief)	2	4,200.00
Admeasurer	7	3,800.00
Chief Clerk	2	3,300.00
Clerk	2	2,800.00
	1	2,700.00
	3	2,300.00
	1	2,100.00
	2	1,560.00
Coxswain Engineer	9	1,848.00
Chief Dispatcher	2	3,100.00
Dispatcher (Marine)	8	2,900.00
Dispatcher	1	2,900.00
Engineer (Chief) (Senior)	2	3,540.00
"Tavernilla"	1	3,540.00
"Gorgona"	1	3,540.00
(Towboat)	12	3,480.00
(Supply Boat)	1	2,892.00
Foreman (Dock) (Balboa)	1	2,400.00
Foreman	1	2,400.00
	1	1,800.00
Machinist (Fleet)	1	3,036.00
Machinist	3	2,880.00
Master (Senior) (Towboat) "Gorgona"	1	3,600.00
Master (Senior) "Tavernilla"	1	3,600.00
(Senior) (Towboat)	10	3,600.00
(Towboat)	14	3,540.00
(Senior) (Supply Boat)	1	2,952.00
Oiler	2	S 1,200.00
Operator (Radio) "Gorgona"	1	1,740.00
Pilot	54	4,800.00
Signalman	10	1,740.00
Signalman (Flamenco Island)	7	300.00
Pilot-in-Charge (Lighthouse Subdivision)	1	5,100.00
Machinist (Leadingman)	1	3,300.00
Clerk	1	3,000.00
	1	1,440.00
Electrical Assistant	1	3,336.00
Boatbuilder	1	2,700.00

NOTE.—Where subsistence is furnished in addition to money compensation, the fact is indicated by the symbol "S" preceding the rate.

Some employees of "The Panama Canal" hold concurrently, two or even three allied positions having different rates of compensation, their actual pay being determined by their assignments to the several varieties of work. In this outline these dual-rate and triple-rate positions are indicated by brackets. A multiple rate should not be confused with multiple salary.

	Coxswain Engineer	1	1,848.00
	Ironworker	1	2,904.00
	Machinist	1	2,880.00
	Electrical Assistant	1	3,336.00
	Electrician	1	3,096.00
	Foreman	1	2,880.00
	Wrecking Master "Favorite"	1	3,000.00
	Master (Senior) "Favorite"	1	$ 4,068.00
	Mate (Second) "Favorite"	1	$ 2,508.00
	(Third) "Favorite"	1	$ 1,800.00
	(Diver) "Favorite"	1	$ 3,240.00
	Engineer (Chief) (Senior) "Favorite"	1	$ 3,768.00
	Engineer (First Assistant) "Favorite"	1	$ 2,808.00
	Engineer (Second Assistant) "Favorite"	1	$ 2,508.00
	Boatswain "Favorite"	1	1,440.00
	Machinist-Craneman "Favorite"	1	3,216.00
	Master (Senior) (Towboat), Tug "Engineer"	1	3,600.00
	Engineer (Chief) (Senior)	1	3,540.00
	Lighthouse Keeper (Toro Point)	1	984.00
2.	Mechanical Division		
	Superintendent	1	6,000.00
	Assistant Superintendent	1	5,400.00
	Assistant to the Superintendent	1	5,100.00
	Accountant (Shop)	1	4,000.00
	Accountant	2	3,200.00
		1	2,800.00
		2	2,600.00
		1	2,300.00
	Chief Clerk	1	3,500.00
	Clerk	1	3,200.00
		1	2,800.00
		1	2,600.00
		3	2,300.00
		3	2,100.00
		3	1,800.00
		2	1,440.00
	Timekeeper	1	1,920.00
	Supervising Draftsman	1	4,080.00
	Draftsman (Design)	1	3,444.48
		1	2,970.24
	(Grade A)	1	3,319.68
	(Design) (Marine)	2	3,319.68
	Copyist	1	1,822.08

Tracer	1	2,112.00
Production Superintendent	1	5,400.00
Master Machinist	1	4,800.00
General Foreman (Shipfitters and Boilermakers)	1	4,800.00
Foreman Shipwright and Dockmaster	1	4,800.00
General Foreman (Car Department)	1	4,800.00
Foreman (Outside Marine Machinist)	1	4,560.00
General Foreman (Roundhouses)	1	4,560.00
Foreman (Molder)	1	4,500.00
(Shipwright) Dockmaster and Diver	1	4,500.00
Foreman (Machinist)	1	4,080.00
(Machine Shop)	1	4,080.00
(Shipfitter)	1	4,080.00
(Paint Shop)	1	4,080.00
(Car Shop)	1	4,080.00
(Roundhouse, Cristobal)	1	4,080.00
Foreman (Boiler Shop)	1	4,080.00
(Wreckmaster and Rigger)	1	4,080.00
Foreman (Car Shop) (Cristobal)	1	3,660.00
(Power Plant)	1	3,600.00
(Yard) (Balboa)	1	3,120.00
(Machine Shop) (Balboa)	1	3,840.00
Coppersmith (Leadingman)	1	3,245.00
Instrument Maker (Leadingman)	2	3,320.00
Blacksmith (Leadingman)	1	3,145.00
Boilermaker (Leadingman)	1	3,145.00
Machinist (Leadingman)	10	3,145.00
Painter (Leadingman)	3	3,195.00
Pipefitter (Leadingman)	1	3,345.00
Saw Filer (Leadingman)	1	3,195.00
Shipfitter (Leadingman)	4	3,145.00
Shipwright (Leadingman)	2	3,145.00
Welder, Gas (Leadingman)	2	3,095.00
Leadingman	2	3,145.00
Carman (Leadingman)	2	3,145.00
Planner	1	3,600.00
Planner and Estimator	3	3,345.00
Boilermaker (Layerout)	2	2,820.00
Machinist (Layerout)	2	2,820.00
Molder (Leader)	1	3,070.00

Anglesmith (Special), and Boilermaker	1	2,820.00 2,700.00
Anglesmith (Heavy Fire)	1	2,920.00
Apprentice	23	2,076.00
Blacksmith (Heavy Fire), and Heavy Forger	2	2,920.00 4,168.00
Blacksmith (Heavy Fire)	1	2,920.00
Blacksmith, and Blacksmith (Heavy Fire)	1	2,676.00 2,920.00
Blacksmith	7	2,676.00
Blacksmith, and Craneman (Overhead Electric)	1	1,722.00 2,621.00
Boatbuilder	3	2,676.00
Boilermaker	31	2,676.00
Boilermaker, and Boilermaker (Special)	1	2,676.00 2,820.00
Hostler, Boilermaker and Craneman (Overhead Electric)	1	[1] 2,748.00 2,220.00 2,676.00
Boilermaker, and Boilermaker (Layerout)	1	2,676.00 2,820.00
Boilermaker, and Tank Tester	3	2,676.00 2,820.00
Boilermaker, and Flangeturner	2	2,676.00 2,772.00
Cabinetmaker	8	2,700.00
Carman	24	2,676.00
Carman, and Engineer (Steam) (Locomotive Crane)	1	2,676.00 2,724.00
Chipper and Caulker	2	2,676.00
Coppersmith	9	2,868.00
Craneman (Overhead Electric)	4	2,676.00
Electroplater	1	2,724.00
Engineer (Steam) (Crane—50-Ton)	1	3,228.00
Engineer (Steam) (Shop Shifting)	1	2,724.00
Engineer (Steam) (Shop Shifting), and Helper	1	2,724.00 1,776.00
Engineer (Steam) (Locomotive Crane)	1	2,928.00
Engineer (Steam) (Locomotive Crane), and Helper	2	2,724.00 1,776.00
	1	2,400.00 1,776.00
Flangeturner, and Anglesmith (Special)	1	2,772.00 2,820.00

Helper	19	1,776.00
Helper, and Engineer (Steam) (Locomotive Craneman)	1	1,776.00 2,621.00
Helper, and Craneman (Overhead Electric)	1	1,622.00 2,676.00
	1	1,548.00 2,676.00
	1	1,776.00 2,676.00
Hostler	3	2,748.00
Inspector (Boiler)	1	3,024.00
(Car)	5	3,192.00
(Scale)	2	2,880.00
Instrumentmaker	5	2,844.00
Ironworker	1	2,700.00
Loftsman	1	2,796.00
Machinist	103	2,676.00
Machinist and Craneman (Overhead Electric)	1	2,376.00 2,676.00
	1	2,220.00 2,676.00
	1	2,076.00 2,676.00
	1	2,376.00 2,676.00
Machinist, and Elevator Inspector	1	2,676.00 2,820.00
Molder	13	2,920.00
Operator (Air Compressor)	1	3,036.00
Painter (Letterer and Grainer)	3	2,868.00
Painter	4	2,724.00
Patternmaker	3	3,195.00
Pipefitter, and Leadburner	1	2,868.00 3,245.00
Pipefitter, Plumber, and Leadburner	1	2,868.00 2,868.00 3,245.00
Pipefitter	16	2,868.00
Planing Mill Hand, and Patternmaker	1	2,724.00 3,195.00
Planing Mill Hand	5	2,724.00
Planing Mill Hand, and Carman	1	2,724.00 2,676.00
Plumber (Ship), and Leadburner	1	2,868.00 3,245.00
Plumber (Ship)	1	2,868.00

Rigger, and Diver	1	2,700.00 5,816.00
Rigger, Steam Engineer, and Diver	1	2,700.00 2,724.00 5,816.00
Rigger	5	2,700.00
Riveter, and Welder (Electrical)	1	2,676.00 2,748.00
Riveter	15	2,676.00
Rivet Tester, and Boilermaker	1	2,820.00 2,676.00
Roller, and Blacksmith	1	2,920.00 2,676.00
Sheet-metal Worker	4	2,868.00
Shipfitter, and Flangeturner	1	2,676.00 2,772.00
Shipfitter	19	2,676.00
Shipjoiner	5	2,676.00
Shipwright	20	2,676.00
Toolmaker	7	2,844.00
Typewriter and Adding Machine Repairman	2	2,880.00
	1	2,520.00
Watchman	3	2,100.00
Welder (Gas)	12	2,676.00
(Electric)	4	2,748.00
(Gas), and (Electric)	1	2,676.00 2,748.00
Wiremen	3	2,868.00
3. Municipal Engineering Division		
Municipal Engineer	1	4,800.00
Superintendent (Northern District)	1	4,600.00
Director of Water Purification	1	4,800.00
Asst. Director of Water Purification	1	4,200.00
Chemist	1	3,900.00
Superintendent, Filtration Plant	3	3,300.00
Engineer, Junior	3	3,300.00
	1	3,100.00
Engineer, Junior-Surveyor	1	3,000.00
Office Assistant	1	3,200.00
Clerk	2	2,800.00
	1	2,700.00
	1	2,600.00
	1	2,500.00
	1	2,100.00
	4	1,560.00
Foreman (General)	7	3,600.00
(Assistant General)	1	3,120.00

	Foreman	3	3,180.00
		3	3,060.00
		5	2,940.00
		2	2,880.00
		1	2,700.00
		1	2,400.00
		1	1,200.00
	Inspector (Meter)	1	3,000.00
	(Plumbing) (Chief)	1	3,360.00
	(Plumbing)	1	3,024.00
	Machinist	1	3,048.00
		1	2,880.00
		2	2,676.00
	Operator (Filtration Plant)	4	2,724.00
	(Incinerator)	3	2,928.00
	(Pumping Plant—Gamboa)	4	2,784.00
	Operator (Relief-Pumping Plant)	2	2,784.00
	Engineer (Steam-shovel)	1	3,528.00
	Pumpman	13	2,664.00
	Recorder	1	1,440.00
	Surveyor	1	2,400.00
	Watchman	1	900.00
4.	Dredging Division		
	Superintendent	1	5,000.00
	Apprentice (Machinist)	1	2,076.00
	Blacksmith (Heavy Fire)	1	2,920.00
	(Drill Barge)	3	2,621.00
	Boilermaker (Special)	1	3,240.00
		1	2,700.00
	Chief Clerk	1	3,500.00
	Clerk	1	3,200.00
		1	2,800.00
		2	2,600.00
		1	2,700.00
		1	2,300.00
	Coppersmith	1	2,868.00
	Coxswain-Engineer	1	1,848.00
	Drill Runner (Drill Barge)	14	2,676.00
	Blaster	4	2,772.00
	Engineer (Assistant)	1	4,200.00
	(Drill Barge) 26—day 28—day	8	2,724.00 2,928.00
	(Chief) (Dipper Dredge)	3	3,780.00
	Engineer (Dipper Dredge)	7	3,360.00
	(Chief) (Ladder Dredge)	1	3,030.00

Engineer (Chief) (Pipe Line Suction Dredge)	1	3,276.00
Engineer (1st Asst.) (Pipe Line Suction Dredge)	1	3,096.00
Engineer (2d Asst.) (Pipe Line Suction Dredge)	3	2,976.00
Engineer (Hydraulic Grader)	1	3,096.00
(Junior)	1	3,500.00
(Junior-Surveyor)	1	3,000.00
(Chief) (Steam Plnt.) (Electric Equipment)	1	3,540.00
Engineer (Steam) (Loco. Crane)	1	2,724.00
(Steam)	4	2,928.00
(Chief) (Towboat)	14	3,480.00
(Chief) (Senior) (Towboat)	7	3,540.00
Foreman	1	3,060.00
	1	2,100.00
Foreman (Water Hyacinth Extermination)	1	2,520.00
Foreman (Barge Repair)	1	3,000.00
	1	2,520.00
(General)	1	3,840.00
(Hydraulic Grader)	2	2,532.00
(Painter)	1	3,192.00
(Pipe Line Suction Dredge)	2	2,772.00
Foreman (Supply)	1	2,580.00
Helper, and Engineer (Steam)	1	1,776.00 2,724.00
Inspector (Dump)	2	1,740.00
Machinist	7	2,676.00
Master and Supervisor "Ajax" and "Hercules"	1	3,600.00
Master (Drill Barge)	2	3,216.00
(Dipper Dredge)	3	3,840.00
(Ladder Dredge)	1	3,210.00
(Pipe Line Suction Dredge) and Master (Pipe Line Suction Dredge and Relay)	1	3,336.00 3,756.00
Master (Hydraulic Grader)	1	3,444.00
(Towboat)	11	3,540.00
(Senior) (Towboat)	6	3,600.00
(Craneboat)	1	3,720.00

Mate (Drill Barge)	2	3,036.00
(Dipper Dredge)	7	3,540.00
(Pipe Line Suction Dredge)	3	3,144.00
(Hydraulic Grader)	2	3,144.00
(Ladder Dredge)	1	1,800.00
Nozzleman (Hydraulic Grader)	1	2,880.00
Operator (Sand Crane), and Operator (Shovel and Drag Line Excavator)	1	2,928.00 3,168.00
Operator (Dipper Dredge)	8	3,720.00
(Machinist)	1	2,880.00
Operator-Master (Floating Crane)	1	3,204.00
Engineer (Junior)	1	3,300.00
Operator (Pipe Line Suction Dredge)	4	3,324.00
Pipefitter	2	2,868.00
Pumpman (Hydraulic Grader and Shore Relay)	3	2,472.00
Pumpman (Relay Pump Barge)	4	2,664.00
Recorder	1	1,680.00
Recorder (Survey)	1	1,680.00
(Student)	1	1,080.00
Boilermaker, and Shipfitter	1	2,700.00 2,621.00
Carpenter (Fleet), and Shipwright	2	2,720.00 2,621.00
Supervisor and Master (Dipper Dredge)	1	4,200.00
Supervisor	1	4,200.00
(Assistant)	2	3,840.00
Surveyor	1	2,700.00
Wireman	1	2,868.00

5. Panama Railroad Company

1. Superintendent Division

Superintendent	1	6,000.00
Assistant Superintendent	1	3,900.00
Assistant Engineer	1	3,800.00
Commercial Agent	1	3,500.00
Clerk	2	2,800.00
	2	2,700.00
	1	2,600.00
	1	2,400.00
	2	2,300.00
	2	2,100.00
	1	1,800.00
	1	1,560.00
	1	900.00

Motorman (P. R. R. Inspector), and Motorman (Relief)	1	3,204.00 3,204.00
Motorman (P. R. R. Inspector)	1	3,204.00
Counsel, P. R. R.	1	5,000.00
Land Agent and Assistant Counsel	1	4,200.00
Inspector (Land)	2	2,700.00
Draftsman	1	2,100.00
Attorney	1	1,500.00
Station Agent (Panama)	1	3,360.00
(Colon)	1	3,360.00
Chauffeur (Special)	2	2,736.00
Watchman	1	1,500.00
	1	900.00
Steamship Ticket Agent	1	3,360.00
Superintendent of Stables	1	2,600.00
Cashier	1	2,300.00
Local Agent (Panama)	1	3,900.00
Roadmaster	1	4,350.00
Foreman (General)	1	3,600.00
Foreman (Yard) (Balboa)	1	2,940.00
Foreman (Yard) (Cristobal)	1	2,880.00
Foreman (Carpenter) (Maintenance of Way)	1	3,168.00
Foreman (Track), and Foreman (Carpenter)	1	2,700.00 3,168.00
Foreman (Track) (Maintenance of Way)	9	2,700,00
Engineer (Steam Shovel)	2	3,528.00
Craneman (Steam Shovel)	1	3,144.00

2. Transportation Division

Master of Transportation	1	4,800.00
Clerk	1	3,000.00
	1	2,600.00
	1	1,440.00
Yardmaster (General)	1	3,624.00
Yardmaster	1	3,384.00
Conductor (Road), and Conductor (Inside)	12	3,384.00 3,144.00
Conductor (Road)	7	3,384.00
Conductor (Inside), and Yardmaster	1	3,144.00 3,384.00
Conductor (Inside)	3	3,144.00
Engineer (Road), and Engineer (Inside)	12	3,624.00 3,144.00
Engineer (Road)	6	3,624.00
(Inside)	4	3,144.00

Motorman, Conductor (Road), and Conductor (Inside)	2	3,204.00 3,384.00 3,144.00
Motorman, Engineer (Road), and Engineer (Inside)	2	3,204.00 3,624.00 3,144.00
Collector (Train)	3	2,508.00
	1	2,262.00
Dispatcher (Train)	3	3,836.00
(Train) (Relief), and Ticket Agent and Operator	2	3,836.00 3,288.00
Dispatcher (Train) (Relief), and Station Agent and Operator	2	3,836.00 3,288.00
Station Agent and Operator	13	3,288.00
3. Coaling Station		
Superintendent	1	4,800.00
Supervisor (Mechanical)	1	4,116.00
Foreman (General) (Docks and Structures)	1	4,116.00
Operator (Chief), and Supervisor (Night)	1	4,116.00 3,960.00
Supervisor (Electric)	1	3,960.00
Chief Clerk	1	3,300.00
Clerk (Time, Labor and Payroll Distribution)	1	2,800.00
Clerk (Coal and Weigh)	1	2,800.00
(Property and Weigh)	1	2,800.00
Operator (Telephone)	2	1,560.00
Supervisor, and Operator (General)	2	3,960.00 3,576.00
Operator (General)	2	3,576.00
(Engineer), and Operator (General)	5	3,096.00 3,576.00
Operator (Engineer)	2	3,096.00
(Engineer), and Operator (Derrick Barge)	3	3,096.00 3,216.00
Operator (Rigger)	1	3,096.00
Foreman (Coal)	1	3,120.00
Foreman (General), and Foreman (Coal)	1	3,960.00 3,120.00
Operator (Electrician)	2	3,096.00
Supervisor, and Operator (Electrician)	1	3,960.00 3,096.00
Operator (Electrician)	3	3,096.00
(Machinist)	3	3,096.00
(General Mechanic)	3	3,096.00

Blacksmith	1	2,822.00
Carpenter	1	2,904.00
4. Commissary Division		
General Manager	1	5,400.00
Assistant General Manager	1	4,200.00
Chief Commissary Inspector	1	3,900.00
Chief Clerk	1	3,500.00
Clerk	1	3,200.00
Inspector	1	3,300.00
Mechanical Supervisor	1	3,960.00
Engineer (Refrigerator)	1	3,588.00
Supervisor (Electrical—Mt. Hope Plant)	1	3,588.00
Master Baker	1	3,480.00
Baker Foreman	1	2,880.00
Meat Cutter	12	2,652.00
(Apprentice)	1	2,100.00
Cashier	3	1,560.00
	2	1,200.00
	1	1,080.00
Chemist	1	3,300.00
Accountant	1	2,600.00
Clerk	1	3,300.00
	3	2,800.00
	1	2,700.00
	8	2,600.00
	6	2,300.00
	12	2,100.00
	24	1,800.00
	17	1,560.00
	2	1,440.00
	1	1,200.00
Foreman (Carpenter)	1	3,170.00
Superintendent (Abattoir and Cold Storage Plant)	1	3,900.00
Buyer (Wholesale Dry Goods)	1	3,600.00
Foreman (General Groceries)	1	3,300.00
(Ancon Laundry)	1	3,300.00
(Cristobal Laundry)	1	3,060.00
(Wholesale Dry Goods)	1	3,000.00
(Sausage Maker and Abattoir)	1	2,972.00
Foreman (Cold Storage)	2	2,880.00
(Laundry)	1	3,000.00
(Ice Cream Plant and Pasteurizing Milk)	1	2,700.00
Foreman (Ice Cream Plant)	1	2,856.00

Foreman	1	2,700.00
Foreman (Wholesale Shoes)	1	3,000.00
(Wholesale Hardware)	1	3,000.00
Foreman	3	2,700.00
	4	2,400.00
	2	2,340.00
	1	2,220.00
	5	2,100.00
	1	2,040.00
	6	1,980.00
	5	1,800.00
	2	1,620.00
Watchman	16	1,500.00
Electrician	4	2,868.00
Battery Repairman	1	2,868.00
Blacksmith	1	2,472.00
Engineer (Steam) (Refrigerating)	5	2,868.00
(Apprentice)	1	1,680.00
Engineer	4	2,568.00
Helper	1	1,776.00
Machinist	3	2,676.00
Operator (Refrigerating Plant)	4	3,096.00
Pipefitter	2	2,868.00
Planing Mill Hand	1	2,724.00
Commissary Manager	3	3,900.00
	4	3,000.00
	3	2,400.00
	1	1,980.00
Assistant Commissary Manager	8	3,000.00
	1	2,400.00
	1	1,980.00
Assistant (Dry Goods) (Female)	1	2,400.00
Head Saleswoman	4	1,800.00
	1	1,560.00
Saleswoman	21	1,320.00
	18	1,080.00
	2	840.00
5. Cattle Industry Division		
Superintendent	1	4,800.00
Veterinarian	1	3,900.00
Foreman	2	2,940.00
	1	2,340.00
Accountant	1	2,800.00
6. Hotel Washington		
Manager	1	$ 3,000.00
Assistant to Manager	1	2,600.00

Hotel Assistant	1	2,300.00
	3	2,100.00
Telephone Operator	2	1,560.00
7. Receiving and Forwarding Office		
Receiving and Forwarding Agent	1	5,400.00
Assistant	1	3,600.00
	1	3,500.00
Clerk	3	2,800.00
Accountant	1	3,200.00
Clerk (Chief) (Cargo)	1	2,800.00
(Claims) (Steamship)	1	2,800.00
(Specie)	1	2,800.00
Clerk	1	2,700.00
(Cargo) (In charge of piers)	2	2,600.00
Clerk	1	2,600.00
(Per Cargo)	1	2,600.00
(Ex Cargo)	1	2,600.00
(Cargo)	5	2,600.00
	6	2,300.00
Clerk	9	2,300.00
	10	2,100.00
	12	1,800.00
	4	1,560.00
	1	1,440.00
Foreman (Watchman)	1	3,000.00
(Maintenance)	1	2,880.00
(Battery Repair)	1	3,456.00
Foreman	1	2,700.00
	1	1,800.00
Chief Stevedore	1	3,960.00
Head Stevedore Foreman	3	3,660.00
	1	3,420.00
Head Stevedore (night work)	1	3,780.00
Stevedore (Foreman)	7	2,976.00
Battery Repairman	2	3,096.00
Wireman	1	3,096.00
Custodian of Floating P. R. R. Equipment	1	2,100.00
6. Fortification Division[1]		
Engineer (Assistant)	1	4,200.00
Supervisor (Electrical)	1	3,600.00
Clerk	1	2,300.00
	1	2,100.00
Draftsman (Design)	1	3,300.00
	1	2,900.00

[1] Included for information only, since this division is not under the Governor.

Draftsman	1	2,700.00
Engineer (Junior)	1	3,500.00
	1	3,200.00
Foreman	1	3,060.00
	1	2,880.00
	2	2,460.00
	1	1,920.00
Foreman (Property and Material)	1	2,700.00
Foreman (General)	1	3,450.00
	2	3,300.00
Foreman (Carpenter) (Construction)	1	3,480.00
Mechanic (General)	1	3,300.00
	1	3,120.00
Surveyor	1	2,700.00
Wireman (Maintenance and Construction)	1	2,868.00
Engineer (Steam)	1	2,928.00
	1	2,724.00
Foreman (Rigger)	1	3,168.00
7. Electrical Division		
Electrical Engineer	1	5,200.00
Superintendent of Power	1	4,500.00
Superintendent of Maintenance and Construction	1	4,500.00
Supervisor of Distribution	1	3,960.00
of Signals (R. R.)	1	3,960.00
Supervisor (Northern District)	1	3,960.00
(Southern District)	1	3,960.00
(Telephones)	1	3,960.00
Supervisor of Transmission	1	3,960.00
Apprentice	1	2,076.00
Armature Winder	5	2,868.00
Battery Repairman	1	3,096.00
Cablesplicer (Maintenance), and (Construction)	2	2,868.00 3,769.00
Cablesplicer	2	2,868.00
Clerk	3	2,800.00
	2	2,600.00
	1	2,300.00
	2	2,100.00
Dispatcher (Power)	4	3,588.00
Engineer (Junior)	1	3,300.00
(Junior) (Assistant)	1	2,600.00
(Station) (Power Plant)	2	3,960.00
(Steam)	3	3,096.00
Estimator and Designer	1	3,500.00

Foreman (Armature Shop)	1	3,600.00
(Elec'l) (Maintenance) and (Elec'l) (Construction)	2	3,468.00 – 3,960.00
Foreman (General) (Telephone)	2	3,588.00
(Material)	1	2,928.00
Helper	3	1,776.00
Inspector (Meter)	2	2,868.00
(Telephone)	5	3,096.00
Wireman (Construction), and Inspector (Telephone)	1	3,669.00 – 3,096.00
Instrument (Repairman)	1	3,120.00
Lineman (Transmission)	1	3,156.00
Machinist (Electrical)	2	2,868.00
Machinist and Engineer	1	3,096.00
Operator (Floor)	4	3,096.00
(General)	7	3,348.00
(Chief) (Power Plant)	2	3,708.00
(Switchboard)	6	3,096.00
	7	2,928.00
(Telephone) (Chief)	2	2,300.00
(Telephone) (Supervising)	5	1,920.00
Operator (Telephone) (Special)	12	1,740.00
	26	1,560.00
	11	1,140.00
Operator and Wireman	3	3,096.00
Recorder (Electrical)	1	3,600.00
Signal Maintainer	5	2,652.00
Assistant Signal Maintainer	1	1,992.00
Wire Chief	1	3,468.00
Wireman (District) (Maintenance), and Wireman (District) (Construction)	2	3,096.00 – 3,768.00
Wireman (District)	3	3,096.00
Wireman (Maintenance), and Wireman (Construction)	18	2,868.00 – 3,769.00
Wireman (Leadingman)	1	3,345.00
Wireman	9	2,868.00
Switchman (Automatic Telephone)	4	3,096.00
Telephone Installer	3	2,568.00

8. Lock Operating Division

1. Atlantic

Superintendent	1	4,800.00
Assistant Superintendent	1	4,260.00
Supervisor (Electric)	1	3,960.00
(Machinist)	1	3,960.00
Lockmaster (Senior)	2	3,708.00

Foreman (General) (Locks)	1	3,708.00
Clerk	1	3,200.00
	1	2,600.00
	1	2,400.00
Operator (Telephone)	2	1,560.00
Foreman (Painter)	1	3,348.00
Operator (Lock Control) (Senior)	1	3,588.00
	6	3,468.00
Lockmaster (Junior)	4	3,588.00
Operator (Locomotive) (Senior)	2	3,348.00
(Tunnel)	6	3,348.00
(Lock Towing)	44	3,096.00
(Lock Towing), and Diver	1	3,096.00 3,320.00

2. Pacific

Superintendent	1	4,800.00
Assistant Superintendent	1	4,260.00
Supervisor (Electrical)	2	3,960.00
(Mechanical)	2	3,960.00
Lockmaster (Senior)	4	3,708.00
Clerk	1	3,200.00
	1	2,600.00
	1	2,400.00
Foreman (Painter)	1	3,588.00
(Property and Material)	1	2,940.00
(Carpenter)	1	3,168.00
(Utility)	2	2,832.00
Operator (Lock Control) (Senior)	2	3,588.00
Operator (Lock Control)	12	3,468.00
(Locomotive) (Senior)	4	3,348.00
(Tunnel)	14	3,348.00
Lockmaster (Junior)	2	3,588.00
Operator (Lock Towing)	69	3,096.00
(Lock Towing), and Diver	1	3,096.00 5,816.00
Machinist	1	2,676.00

9. Section of Surveys

Assistant Engineer (in charge)	1	4,200.00
Engineer (Junior)	1	3,800.00
	1	3,300.00
	2	3,100.00
(Junior-Surveyor)	1	3,000.00
Surveyor	1	2,700.00
	1	2,400.00
	1	2,200.00
	1	2,100.00
	4	1,920.00

Recorder (Survey)	1	1,680.00
	2	1,440.00
10. Office Engineer Section		
Office Engineer	1	4,600.00
Assistant Engineer	1	3,800.00
Clerk	1	2,600.00
Draftsman	1	3,500.00
	2	3,300.00
	2	2,900.00
	1	2,700.00
Architect	1	3,900.00
Draftsman (Architectural)	2	3,600.00
(Structural)	1	3,000.00
(General) (Electrical)	1	2,700.00
Engineer (Junior)	1	3,600.00
(Designer)	1	3,500.00
Draftsman	1	3,000.00
11. Meteorology and Hydrography Section		
Chief Hydrographer	1	4,200.00
Assistant Chief Hydrographer	1	3,500.00
Hydrographer	1	2,800.00
	1	2,400.00
Observer	1	2,200.00
Meteorologist	1	3,000.00
	1	2,800.00
	1	2,600.00
12. Gatun Dam and Backfill		
Foreman (General)	1	3,420.00
(Utility)	1	2,832.00
	1	2,712.00
3. Executive Department		
1. Executive Office		
Executive Secretary	1	6,000.00
Chief Clerk	1	4,600.00
2. Record Bureau		
Chief of Bureau	1	3,500.00
Chief of Section	2	3,200.00
Clerk	5	2,800.00
	3	2,600.00
	3	2,300.00
Translator	1	2,300.00
Clerk	6	2,100.00
	1	1,800.00
	1	1,560.00
Librarian	1	2,600.00
Assistant Librarian	1	2,100.00
Cataloger	1	1,980.00

	Assistant to Librarian	1	1,560.00
		1	1,440.00
3.	Personnel Bureau		
	Chief of Bureau	1	3,600.00
	Clerk	2	3,200.00
		1	3,000.00
		3	2,800.00
		2	2,600.00
		4	2,300.00
		2	2,100.00
		1	1,800.00
4.	General Bureau		
	Surveying Officer	1	3,600.00
	Assistant Surveying Officer	1	3,200.00
	Photographer	1	3,000.00
	Inspector	1	3,200.00
		1	2,800.00
	Clerk	2	2,800.00
		1	2,600.00
	Supervising Rollkeeper	1	3,200.00
	Relief Rollkeeper	1	2,800.00
5.	Bureau of Statistics		
	Chief of Bureau	1	4,600.00
	Editor and Statistician	1	3,500.00
	Statistician	1	3,200.00
		1	2,900.00
	Clerk	2	2,300.00
6.	Correspondence Bureau		
	Chief of Bureau	1	3,200.00
	Office Assistant	2	3,200.00
	Clerk	2	2,800.00
		1	2,600.00
		1	2,400.00
		6	2,300.00
		5	2,100.00
		1	1,800.00
7.	Property and Requisition Bureau		
	Chief of Bureau	1	3,300.00
	Clerk	1	3,200.00
		2	2,800.00
		2	2,600.00
		4	2,300.00
		3	2,100.00
8.	District Court		
	District Judge	1	7,500.00
	Clerk of Court	1	3,600.00
	(Senior Assistant)	1	2,800.00
	(Assistant)	1	2,600.00

	Clerk	1	2,800.00
	Magistrate, and Judge (District) (Special)	1	3,600.00 / 7,500.00
9.	Magistrate Court		
	Magistrate	1	3,600.00
	Constable	2	2,436.00
10.	District Attorney		
	District Attorney	1	5,000.00
	Assistant District Attorney	1	3,900.00
	Clerk	1	2,800.00
	United States Marshal	1	5,000.00
	(Deputy)	1	2,600.00
11.	Police and Fire Division		
	Chief of Division	1	4,800.00
	Inspector (Police)	1	3,780.00
	Captain	3	3,480.00
	Lieutenant	5	3,132.00
	Sergeant	5	2,784.00
		10	2,700.00
	Policeman	108	2,436.00
	Inspector (Fire)	1	3,600.00
	(Motor)	1	2,880.00
	Captain	2	2,904.00
	Lieutenant (Fire)	6	2,724.00
	Sergeant (Fire)	4	2,556.00
	Fireman	30	2,436.00
12.	Division of Schools		
	Superintendent	1	4,800.00
	Assistant to Superintendent (Upper Grades)	1	4,200.00
	Assistant to Superintendent (Lower Grades)	1	3,600.00
	Supervisor of Music	1	2,664.00
	of Penmanship	1	2,664.00
	Principal (High School) (Balboa)	1	3,600.00
	Principal (High School) (Cristobal)	1	2,799.00
	Principal (Grade School)	1	2,511.00
		1	2,940.00
		1	2,332.00
		3	2,052.00
	Teacher (High School)	14	2,469.00
	(Manual Training)	2	2,469.00
	(Household Arts)	2	2,469.00
	(Line)	3	2,376.00

	(Grade School)	58	1,971.00
	(Panama)	2	780.00
		1	660.00
		1	510.00
13.	Division of Civil Affairs		
	Chief of Division	1	4,800.00
	Office Assistant	1	3,300.00
	Clerk	1	2,800.00
	Clerk (Estates)	1	2,800.00
	Inspector (Post Office)	1	3,300.00
	Postmaster	1	4,000.00
		1	3,624.00
		1	3,252.00
		1	3,000.00
		1	2,556.00
		3	2,436.00
		1	2,088.00
		3	1,320.00
		1	300.00
	Assistant Postmaster	1	3,012.00
		1	2,784.00
		1	2,664.00
	Chief Dispatching Clerk	1	2,664.00
	Chief Registry Clerk	1	2,664.00
	Clerk (Money Order)	1	2,556.00
	(Special Relief)	1	2,556.00
	(Postal)	21	2,436.00
	Clerk	3	1,440.00
		3	1,140.00
	Chief Customs Inspector	2	3,500.00
	Clerk	2	2,100.00
	Inspector (Customs)	4	2,500.00
		2	2,200.00
	Guard (Customs)	2	1,980.00
	Inspector (Customs) (Assistant Chief), and Deputy Shipping Commissioner	2	3,200.00
	Deputy Shipping Commissioner (Special)	2	3,000.00
	Deputy Shipping Commissioner	2	2,700.00
		2	2,500.00
	Boarding Officer	5	2,700.00
14.	Bureau of Clubs and Playgrounds		
	General Secretary	1	3,900.00
	Business Secretary	1	3,000.00
	Physical Director	1	2,700.00

Secretary	3	3,000.00
	2	2,600.00
Asst. Secretary and Office Assistant	3	2,600.00
Assistant Secretary and Physical Director	1	2,400.00
Secretary (Silver Clubhouse)	1	2,040.00
	1	1,860.00
	3	1,620.00
Clerk	1	2,040.00
	1	1,740.00
	1	1,320.00
	1	900.00
	1	840.00
Attendant (Soda Fountain)	1	660.00
	1	600.00
Cashier	2	1,440.00
	2	1,200.00
	2	1,080.00
Cook	1	840.00
	1	720.00
Cashier (Relief)	1	936.00
Playground Directress	2	1,860.00
(Assistant)	3	1,200.00
Foreman	1	1,920.00
Instructor (Swimming Pool)	1	2,400.00
Manager (Moving Picture)	1	2,900.00
Operator (Moving Picture)	1	1,800.00
Saleswoman (Head)	1	1,080.00
Saleswoman	3	840.00
	3	660.00
	2	468.00

4. Accounting Department

1. General Office

Auditor	1	7,000.00
Assistant Auditor	1	4,800.00
Chief Accountant	1	4,200.00
Chief Examiner	1	3,600.00
Claim Officer	1	3,600.00
Panama Railroad Accountant	1	3,600.00
Assistant Chief Accountant	1	3,500.00
Commissary Accountant	1	3,300.00
Assistant Railroad Accountant	1	3,200.00
Chief Traveling Inspector	1	3,300.00
Chief Property Inspector	1	3,200.00
Chief Time Inspector	1	3,200.00
Chief of Section	5	3,200.00
Office Assistant	1	3,200.00

	Accountant	2	3,200.00
		11	2,800.00
		4	2,700.00
		12	2,600.00
		3	2,300.00
	Clerk	6	2,800.00
		5	2,700.00
		12	2,600.00
		1	2,400.00
		19	2,300.00
		27	2,100.00
		1	1,920.00
		10	1,800.00
		1	1,440.00
		2	1,080.00
		1	960.00
	Coupon Book Inspector	4	1,440.00
	Time Inspector (Senior)	1	2,800.00
	Time Inspector	3	2,600.00
		2	2,300.00
	Traveling Inspector	1	3,000.00
		2	2,800.00
	Operative	4	2,100.00
		7	1,800.00
	Head Operative	1	1,380.00
	Operative	12	1,320.00
		5	1,140.00
	Inspector (Cattle Ranch)	1	2,600.00
2.	Collector's Office		
	Collector	1	5,000.00
	Deputy Collector	1	3,900.00
		2	3,300.00
		1	2,900.00
		3	2,800.00
		5	2,600.00
		1	2,300.00
		2	1,800.00
		1	1,320.00
3.	Paymaster's Division		
	Paymaster	1	5,000.00
	Asst. Paymaster and Cashier	1	3,900.00
	Paying Teller	2	3,300.00
	Pay Clerk	3	3,000.00
	(Emergency)	1	2,800.00
	Accountant	1	3,200.00
	Clerk	1	2,800.00
		1	2,300.00

5. Health Department

Chief Health Officer	1	7,000.00
Assistant Chief Health Officer	1	5,400.00
Chief, Board of Health Laboratory	1	5,400.00
Chief, Eye and Ear Clinic	1	4,800.00
Asst. to Chief, Eye and Ear Clinic	1	4,400.00
Chief, Medical Clinic	1	7,000.00
Asst. to Chief, Medical Clinic	1	4,400.00
Chief, Surgical Clinic	1	7,000.00
Asst. to Chief, Surgical Clinic	1	4,400.00
Chief, X-Ray Clinic	1	4,800.00
Chief, Radio-Therapy Clinic	1	4,400.00
Chief Quarantine Officer	1	5,400.00
Quarantine Officer	1	4,600.00
	1	4,400.00
Health Officer	1	4,800.00
	1	4,400.00
Superintendent (Ancon Hospital)	1	7,000.00
Assistant Superintendent (Ancon Hospital)	1	4,800.00
Superintendent (Colon Hospital)	1	4,800.00
(Corozal Hospital)	1	4,800.00
(Palo Seco Leper Colony)	1	3,200.00
Dispensary Assistant (Senior)	1	2,400.00
(Junior)	7	2,100.00
Executive Assistant	1	3,600.00
Office Assistant	1	3,500.00
Bacteriologist	1	4,400.00
Chemist	1	3,900.00
Assistant Chemist	1	2,700.00
Clerk	3	2,800.00
	1	2,700.00
	4	2,600.00
	2	2,300.00
	4	2,100.00
	1	1,920.00
Embalmer-Cremator	1	2,700.00
Foreman (Carpenter) (Maintenance)	1	3,170.00
Foreman	1	2,580.00
Clerk	3	1,800.00
	1	1,560.00
Inspector (Quarantine)	1	2,900.00
	1	2,400.00
(Sanitary)	10	3,300.00

Interne	8	900.00
Manager (Farm)	1	2,400.00
General Mechanic	1	3,360.00
	1	2,400.00
Nurse (Chief)	1	2,400.00
	1	2,040.00
	1	1,920.00
(Head)	11	1,800.00
(District)	2	1,800.00
(Care of Insane)	1	1,800.00
(Female)	4	1,800.00
	73	1,620.00
(Male)	5	1,860.00
	3	1,680.00
Pathologist	1	4,400.00
Pharmacist (Senior)	3	2,700.00
Physician (District)	3	4,400.00
Obstetrician	1	3,900.00
Physician	13	3,600.00
	10	3,300.00
	10	3,300.00
Stewardess	1	2,100.00
	1	1,800.00
Storekeeper	1	2,400.00
Technician	6	2,600.00
Vaccinator	1	2,100.00
Veterinarian (Meat Inspector)	1	3,900.00
	3	3,000.00
6. Supply Department		
1. Quartermaster Division		
Chief Quartermaster	1	7,000.00
Superintendent	1	5,400.00
Agronomist	1	4,600.00
Gardener	1	1,800.00
Foreman	1	1,860.00
Chief Clerk	1	3,500.00
Inspector	1	3,300.00
Clerk	2	2,700.00
	1	2,600.00
Custodian	1	2,040.00
2. Purchase and Sales Bureau		
Chief of Bureau	1	3,600.00
Clerk	1	2,800.00
	1	2,600.00
	2	2,300.00
	2	2,100.00

3.	District Quartermaster Division		
	District Quartermaster	1	4,200.00
		1	3,900.00
		1	3,600.00
	Assistant District Quartermaster	3	3,200.00
		1	2,900.00
		1	2,300.00
		1	2,100.00
		1	1,440.00
		1	1,320.00
		2	960.00
	Foreman	2	2,580.00
		1	2,100.00
		1	1,620.00
	Foreman (Utility)	1	2,400.00
	Telephone Operator	1	1,560.00
	Matron	1	1,200.00
4.	Panama Canal Press		
	Printer	1	4,200.00
	Machinist-in-Charge	1	3,756.00
	Monotype Operator	2	3,264.00
	Foreman (Proof room)	1	3,420.00
	Assistant (Proof room)	1	1,560.00
	Foreman (Composing room)	1	3,420.00
	Storekeeper	1	2,600.00
	Apprentice	1	3,096.00
	Watchman	3	1,200.00
5.	Storehouses and Oil Plants		
	General Storekeeper	1	4,600.00
	Storekeeper	1	3,300.00
		1	2,900.00
		1	2,300.00
	Foreman	1	2,880.00
	Chief Clerk	1	3,500.00
	Clerk	2	3,200.00
		3	2,800.00
		3	2,600.00
		1	2,300.00
		3	2,100.00
		3	1,800.00
		3	1,560.00
		4	1,440.00
	Foreman (General)	1	3,300.00
	Foreman	2	3,000.00
		1	3,060.00
		6	2,880.00
		2	2,580.00
		4	2,100.00
	(Oil Plant)	2	3,480.00

	Engineer, Steam (Oil Pump)	10	2,724.00
	Relief (Oil Pump)	2	2,724.00
	Foreman (Cribman)	7	2,472.00
	Gauger	6	2,220.00
	Engineer (Steam) (Loco. Crane)	2	2,724.00
6.	Transportation Division		
	General Foreman	1	4,543.00
	Foreman (Corral Transportation)	1	3,192.00
	Foreman	1	2,880.00
	Clerk	1	2,600.00
	Apprentice	4	2,076.00
	Machinist (Auto Repair)	14	2,676.00
	Chauffeur (Special)	1	2,940.00
		1	2,736.00
	Chauffeur	14	2,580.00
	Chauffeur and Chauffeur (Special)	4	2,580.00 2,780.00
	Wireman	1	2,868.00
7.	Constructing Quartermaster Division		
	Constructing Quartermaster	1	5,400.00
	Foreman (Building Construction), and Foreman (Carpenter—Maintenance)	2	4,680.00 3,170.00
	Bricklayer (Special)	1	4,019.00
	Carpenter	1	2,700.00
	Helper	2	1,622.00
	Painter (Special-Maintenance) (Construction)	1	2,868.00 3,370.00
	Planing Mill Hand	5	2,724.00
	Plasterer (Construction)	4	4,618.00
	Planing Mill Hand (Foreman), Foreman (Carpenter) (Maintenance) and Foreman (Carpenter) (Construction)	1	2,724.00 3,170.00 3,719.00
	Plumber (Maintenance), and Plumber (Construction)	7	2,868.00 3,818.00
	Sheet Metal Worker (Maintenance) (Construction)	1	2,868.00 3,370.00
	Sheet Metal Worker (Maintenance)	1	2,868.00
	Tilesetter	1	2,676.00
	Foreman	1	2,700.00
	Foreman (Material)	1	2,700.00
	(Carpenter—District)	2	3,170.00
	Foreman (Carpenter—Maintenance), and Foreman (Carpenter—Construction)	6	3,170.00 3,719.00

Foreman (Carpenter) (Maintenance)	1	3,170.00
Plumber (Maintenance) (Construction)	1	3,348.00
Foreman (General—Maintenance)	1	3,300.00 3,780.00
Foreman (Painter—District), and Foreman (Painter—Construction)	2	3,195.00 3,769.00
Foreman (Painter—Maintenance)	1	3,195.00
(Planing Mill)	1	3,195.00
(Plasterer—Construction)	1	4,992.00
(Maintenance and Construction)	1	3,348.00 4,080.00
(Sheet Metal Worker) (Maintenance) and Foreman (Sheet Metal Worker) (Construction)	1	3,348.00 3,600.00
8. Hotel Tivoli		
Manager	1	$ 3,600.00
Assistant to Manager	1	2,600.00
Hotel Assistant	1	2,300.00
	3	2,100.00
Seamstress	1	720.00
Steward	1	$ 1,800.00

SCHEDULE I. CANAL ZONE OFFICES

PART II. SILVER ROLL EMPLOYEES (ALIEN)

September 1, 1925

Units of Organization: *Classes of Employees*	*Number*	*Monthly Pay Rate*
1. General Administration		
(No silver employees on rolls)		
2. Department of Operation and Maintenance		
1. Marine Division		
Assistant Keeper, Lighthouse	2	$60.00
Boatswain	11	$ 67.50 to 75.00
	8	67.50 to 72.50
Carpenter	9	60.00 to 72.50
Chauffeur	5	60.00 to 62.50
Cook	11	$ 52.50 to 72.50
Deck Hand	129	per trip 3.50
Fireman	21	$ 55.00 to 67.50
	1	62.50
Laborer[2]	29	45.00 to 55.00
Messenger	3	35.00 to 42.50
Office Helper	22	55.00 to 80.00
Oiler	45	$ 52.50 to 75.00
	1	67.50
Operator Motor Boat	43	50.00 to 77.50
Seaman	52	$ 50.00 to 67.50
	116	47.50 to 67.50
Signalman	3	72.50
Steward	1	$ 75.00
Storeman	2	62.50
Waiter	7	$ 32.50 to 45.00
Watchman	1	52.50
Winchman	1	67.50
Wiper	4	$ 50.00 to 55.00
2. Mechanical Division		
Artisan	4	47.50 to 72.50
	310	per hr. .23 to .37
Boy	5	22.50 to 32.50
	3	per hr. .12
Fireman	10	47.50 to 62.50
Foreman	3	57.50 to 77.50
	1	per hr. .38

[2] In addition to the monthly men the division employs laborers at 20 cents per hour. There were twelve such laborers on September 1, 1925.

	Helper	402	per hr. .21 to .23
	Janitor	5	45.00 to 55.00
	Laborer	113	per hr. .20 to .23
	Messenger	3	35.00 to 50.00
	Office Helper	31	47.50 to 80.00
	Oiler	4	55.00 to 60.00
	Operator, Motor truck, Electric	2	47.50
	Rigger	4	per hr. .24
	Storeman	2	50.00 to 62.50
	Trainman	2	52.50 to 55.00
	Watchman	4	45.00 to 52.50
3.	Municipal Engineering Division		
	Artisan	3	50.00 to 55.00
		212	per hr. .23 to .37
	Attendant (Laborer)	5	55.00 to 65.00
	Boy	3	22.50
		12	per hr. .10
	Chainman	19	47.50 to 62.50
	Chauffeur	5	47.50 to 62.50
	Checker	9	42.50 to 62.50
	Concreteman	47	per hr. .21
	Engineer (Gas)	2	57.50
	(Steam)	1	72.50
	Fireman	7	52.50 to 60.00
	Foreman	5	45.00 to 80.00
	Gardener	5	45.00 to 50.00
	Helper	6	per hr. .21 to .23
	Janitor	2	47.50
	Laborer	1	50.00
		303	per hr. .20
	Messenger	8	35.00 to 60.00
	Office Helper	28	47.50 to 80.00
	Oiler	16	55.00 to 60.00
	Operator (Filter)	14	60.00 to 65.00
	(Pump)	4	52.50 to 62.50
	Patrolman	10	50.00 to 62.50
	Scavenger	5	50.00
	Scytheman	19	per hr. .21
	Sewerman	2	per hr. .24
	Storeman	11	47.50 to 65.00
	Unskilled Laborer	66	per task .15
	Watchman	12	42.50 to 52.50
	Watertender	10	50.00 to 67.50
4.	Dredging Division		
	Artisan	58	per hr. .23 to .37
	Blacksmith	3	$ 55.00 to 57.50

Boatman	26	45.00 to 52.50
	12	S 37.50 to 47.50
Boatswain	3	72.50
	19	S 62.50 to 70.00
Captain	3	75.00 to 100.00
Carpenter	1	S 57.50
Chainman	13	52.50 to 62.50
Chauffeur	1	62.50
Cook	27	S 52.50 to 67.50
	4	50.00 to 62.50
Engineer	2	S 75.00 to 80.00
	6	70.00 to 75.00
Fireman	18	50.00 to 70.00
	31	S 57.50 to 62.50
Foreman	13	62.50 to 72.50
Helper	20	per hr. .21 to .23
Hostler	2	47.50 to 50.00
Janitor	4	45.00 to 47.50
Laborer	2	47.50
	71	per hr. .20 to .21
Leadsman	14	55.00 to 60.00
Messenger	1	52.50
Nozzleman	8	per hr. .23 to .24
Office Helper	12	47.50 to 77.50
Oiler	40	S 52.50 to 72.50
	14	57.50 to 72.50
Operator, Motor Boat	16	55.00 to 72.50
Rigger	2	per hr. .21
Seamen	152	47.50 to 67.50
	135	S 42.50 to 62.50
Storeman	6	55.00 to 60.00
Waiter	12	S 32.50 to 42.50
Watchman	8	42.50 to 52.50
Watertender	5	72.50
	9	S 62.50 to 67.50
Winchman	3	62.50 to 67.50
	4	S 60.00 to 62.50

5. Panama Railroad Company

1. Superintendent Division

Artisan	24	per hr. .23 to .28
Boatman	4	42.50 to 47.50
Checker	4	50.00 to 60.00
	1	per hr. .27
Cook	1	S 50.00
Fireman	1	55.00
Flagman	2	70.00
Foreman	2	47.50 to 75.00
	1	per hr. .30

Janitor	2	47.50 to 50.00
Laborer	101	per hr. .20
Lamplighter	1	52.50
Messenger	2	40.00 to 55.00
Office Helper	16	25.00 to 80.00
Porter	10	55.00
Scytheman	12	per hr. .21
Stableman	7	47.50
Stower	4	per hr. .23
Watchman	8	42.50 to 52.50
2. Transportation Division		
Baggage Master	4	77.50
Brakeman	13	62.50 to 67.50
Fireman (Road)	10	67.50 to 72.50
(Yard)	9	50.00 to 62.50
Flagman (Crossing)	28	47.50 to 60.00
(Road)	9	70.00
Messenger	5	47.50 to 55.00
Office Helper	14	52.50 to 80.00
Porter	2	50.00 to 55.00
Switchman	20	62.50
Switch Tender	2	60.00
3. Coaling Station[3]		
Artisan	3	62.50 to 65.00
	70	per hr. .25 to .37
Chauffeur	2	57.50 to 62.50
Checker	5	60.00 to 62.50
Fireman	14	60.00 to 67.50
Foreman	12	62.50 to 75.00
Gardener	1	50.00
Laborer	1	52.50
Office Helper	9	57.50 to 77.50
Operator (Air Compressor)	2	75.00
(Motor Boat)	7	57.50 to 72.50
Storeman	1	60.00
Watchman	3	45.00 to 52.50
Winchman	2	62.50
4. Commissary Division		
Artisan	2	57.50 to 60.00
	21	per hr. .25 to .30
Baker	17	55.00 to 72.50
Bottlewasher	1	55.00
	3	per hr. .15

[3] In addition to the regular organization, the Coaling Station employs a daily average of approximately 105 coal handlers at 29 cents per hour and four water boys at 12 cents per hour.

Boy	11	22.50 to 30.00
Butcher	29	45.00 to 62.50
	6	per hr. .21 to .27
Chauffeur	1	52.50
Checker	7	60.00 to 62.50
Elevator Man	3	42.50 to 55.00
Fireman	5	52.50 to 72.50
Foreman	10	60.00 to 80.00
Helper	4	30.00 to 32.50
	15	per hr. .21 to .25
Ice Cream Maker	3	52.50 to 60.00
Janitor	10	45.00 to 47.50
Laborer	2	42.50 to 50.00
	35	per hr. .20
Laundress	1	40.00
	166	per hr. .12 to .17
Laundryman	5	45.00 to 62.50
	15	per hr. .20 to .28
Luggerman	86	45.00 to 60.00
	13	per hr. .22 to .26
Messenger	26	35.00 to 47.50
Office Helper	98	42.50 to 80.00
Oiler	3	50.00 to 62.50
Operator (Indust. Lab.)	6	55.00 to 70.00
(Indust. Lab.) (Female)	18	per hr. .13 to .27
(Indust. Trk.)	11	47.50 to 50.00
Salesman	177	47.50 to 70.00
Saleswoman	1	37.50
Storeman	124	45.00 to 80.00
Watchman	3	47.50 to 52.50
5. Cattle Industry Division		
Blacksmith	1	S 55.00
Cattleman	21	S 30.00 to 47.50
Chauffeur	1	52.50
Cook	8	S 35.00 to 42.50
Dairyman	32	35.00 to 42.50
Fireman	1	50.00
Foreman	4	50.00 to 77.50
	8	S 37.50 to 47.50
Gardener	3	47.50 to 50.00
Helper	2	S 25.00
Laborer	5	42.50 to 47.50
	4	S 37.50
	107	per dy. S .60 to .90
Messenger	1	S 32.50
Office Helper	1	62.50
	1	S 70.00

Stableman	3	$ 42.50
Teamster	3	50.00 to 55.00
Watchman	1	$ 45.00
	3	20.00 to 42.50
6. Hotel Washington		
Artisan	2	42.50 to 45.00
	1	per hr. .30
Attendant	1	$ 27.50
Baker	1	$ 70.00
Boy	10	17.50 to 25.00
Butcher	1	$ 62.50
Cook	10	25.00 to 80.00
Fireman	3	$ 45.00
Gardener	1	$ 45.00
Helper	10	$ 25.00 to 35.00
Housekeeper	1	$ 47.50
Janitor	7	$ 30.00 to 50.00
Maid	16	$ 20.00 to 22.50
Messenger	5	30.00 to 40.00
Office Helper	5	$ 42.50 to 77.50
Painter	1	$ 62.50
Printer	1	per hr. .25
Pump Tender	1	$ 57.50
Salesman	2	$ 45.00
Seamstress	1	$ 45.00
Telephone Operator	2	$ 42.50 to 45.00
Waiter	11	$ 30.00
(Head)	3	$ 42.50 to 67.00
Watchman	3	$ 32.50 to 42.50
7. Receiving and Forwarding Agent (Cristobal)		
Artisan	22	per hr. .23 to .25
Boy	3	25.00 to 27.50
Chauffeur	2	60.00 to 62.50
Checker	1	72.50
	29	per hr. .31 to .28
Foreman	8	55.00 to 75.00
	25	per hr. .30 to .32
Gangway-Winchman	79	per hr. .26 to .27
Gardener	1	45.00
Janitor	2	47.50 to 55.00
Longshoreman	61	per hr. .26
Messenger	2	37.50 to 42.50
Motor Truck Operator	34	per hr. .24
Office Helper	27	55.00 to 80.00
Rigger	17	per hr. .24
Trucker	174	per hr. .24

	Watchman	17	47.50 to 50.00
		50	per dy. 1.65
8.	Receiving and Forwarding Agent (Balboa)		
	Artisan	3	per hr. .25 to .28
	Checker	12	per hr. .28 to .31
	Foreman	3	72.50 to 75.00
	Laborer	95	per hr. .24 to .26
	Office Helper	3	60.00 to 77.50
	Watchman	3	50.00 to 52.50
		2	per dy. 1.65
6.	Fortification Division		
	Artisan	1	65.00
		57	per hr. $ .21 to .35
		38	per hr. .20 to .30
	Boy	1	22.50
		1	per hr. $ .08
	Chainman	9	42.50 to 57.50
	Chauffeur	1	$ 62.50
	Checker	2	$ 50.00 to 52.50
	Cook	4	$ 40.00 to 55.00
	Fireman	4	$ 42.50 to 57.50
	Foreman	6	50.00 to 80.00
		3	$ 62.50 to 67.50
	Helper	1	per hr. .21
	Hostler	1	45.00
		1	$ 42.50
	Laborer	46	per hr. .20
		91	per hr. $ .18
	Motor Boat Operator	2	62.50
	Office Helper	3	55.00 to 77.50
		1	$ 75.00
	Powderman	1	per hr. .26
	Seaman	1	57.50
	Steam Engineer	1	$ 50.00
	Storeman	2	50.00 to 62.50
		1	$ 57.50
	Unskilled Laborer	21	per task $ .21
	Watchman	3	42.50 to 62.50
		2	$ 40.00
7.	Electrical Division		
	Artisan	21	47.50 to 62.50
		37	per hr. .23 to .37
	Boatman	3	42.50 to 45.00
	Chauffeur	6	47.50 to 62.50
	Fireman	7	57.50 to 62.50
	Foreman	1	70.00

Helper	21	47.50 to 55.00
	33	per hr. .21 to .23
Laborer	6	42.50
	11	per hr. .20
Office Helper	8	50.00 to 67.50
Operator (Telephone)	9	70.00 to 72.50
8. Lock Operating Division—Atlantic		
Artisan	87	55.00 to 70.00
	18	per hr. .23 to .30
Boatman	12	55.00
Boatswain	1	70.00
Boy	1	per hr. .10
Carpenter	6	57.50 to 65.00
Fireman	1	77.50
(Locomotive)	1	47.50
(Locomotive Crane)	1	45.00
Foreman, Lock	6	77.50
Gardener	1	50.00
Laborer	40	per hr. .20
Lockman	58	50.00
Office Helper	5	62.50 to 80.00
Operator (Air Compressor)	1	77.50
(Telephone)	1	60.00
Scytheman	20	per hr. .21
Splicer (Cable)	1	72.50
Stableman	2	47.50
Storeman	2	57.50 to 60.00
Trainman	1	45.00
Watchman (Night)	1	47.50
9. Lock Operating Division—Pacific		
Artisan	140	50.00 to 72.50
Boatman	16	52.50 to 55.00
Boatswain	8	60.00 to 72.50
Boy	1	22.50
Carpenter	10	60.00 to 70.00
Chauffeur	1	62.50
Foreman	10	75.00 to 77.50
Lockman	128	50.00
Office Helper	7	50.00 to 77.50
Operator (Air Compressor)	1	75.00
(Motor Boat)	2	70.00
Watchman	1	52.50
10. Section of Surveys		
Cook	1	67.50

Chainman	17	47.50 to 57.50
Foreman	3	65.00 to 75.00
11. Office Engineer Division		
Blue Print	1	72.50
Office Helper	1	65.00
12. Meteorology and Hydrography Division		
Boatman	3	42.50 to 45.00
Foreman	5	45.00 to 70.00
Observer	2	45.00 to 47.50
Office Helper	2	60.00 to 67.50
3. Executive Department		
1. General Bureau		
Office Helper	1	77.50
2. Record Bureau		
Boy	2	22.50 to 32.50
Foreman	1	77.50
Messenger	21	35.00 to 75.00
Office Helper	5	67.50 to 80.00
Photographer Helper	1	72.50
3. Correspondence Bureau		
Boy	1	22.50
Office Helper	2	57.50 to 77.50
4. District Court		
Office Helper	2	72.50 to 80.00
5. Magistrate Court		
Office Helper	2	72.50 to 80.00
6. Police and Fire Division		
Policeman	42	55.00 to 80.00
7. Division of Schools [4]		
Teacher	47	77.50 to 80.00
8. Bureau of Clubs and Playgrounds		
Artisan	7	47.50 to 60.00
	11	per hr. .23 to .30
Attendant	20	32.50 to 57.50
Boatman	1	57.50
Boy	3	22.50
Cook	1	50.00
Helper	3	21.25 to 30.00
Janitor	34	45.00 to 55.00
Laborer	6	42.50 to 47.50
	1	per hr. .20
Laundress	2	27.50 to 32.50
Messenger	1	52.50

[4] Figures are as of June 30, 1925. Teachers are not carried on rolls during vacation period.

	Office Helper	13	47.50 to 77.50
	Salesman	3	57.50 to 62.50
	Secretary	1	77.50
	Steward	3	62.50 to 65.00
	Waiter	9	37.50 to 47.50
	Watchman	9	47.50 to 52.50
9.	Division of Civil Affairs		
	Chauffeur	2	60.00
	Office Helper	16	47.50 to 77.50
	Messenger	3	17.50 to 45.00
4.	Accounting department		
	Money Counter	3	77.50 to 102.50
	Office Helper	4	60.00 to 80.00
5.	Health Department		
	Artisan	1	$ 55.00
		16	per hr. .23 to .30
	Attendant	21	32.50 to 70.00
		135	$ 27.50 to 60.00
	Boatman	2	47.50
	Carpenter	1	60.00
	Cemetery Man	9	47.50
	Chauffeur	14	47.50 to 62.50
	Cook	11	$ 35.00 to 75.00
	Crematory Man	1	47.50
	Dairyman	1	42.50
		5	$ 24.38 to 32.50
	Elevator man	3	55.00
	Fireman	2	$ 40.00 to 47.50
		1	45.00
	Foreman	24	$ 45.00 to 77.50
		2	$ 37.50 to 57.50
	Gardener	1	50.00
	Helper	18	$ 25.00 to 37.50
	Janitor	3	45.00 to 47.50
	Janitress	1	35.00
	Laborer	1	42.50
		1	$ 37.50
		224	per hr. .20 to .21
	Laundress	3	25.00 to 30.00
	Maid	56	$ 20.00 to 25.00
	Messenger	5	35.00 to 55.00
		3	$ 30.00 to 50.00
	Office Helper	8	50.00 to 80.00
		1	$ 72.50
	Operator (Motor Boat)	1	$ 70.00
	(Telephone)	3	55.00 to 62.50
	Scavenger	60	50.00

Seaman	1	$ 57.50
Storeman	1	45.00
	1	$ 42.50
Teamster	1	$ 45.00
Waiter	20	$ 30.00 to 47.50
Watchman	4	$ 32.50 to 42.50
6. Supply Department		
1. Quartermaster Division		
Office Helper	2	75.00 to 80.00
Storeman	2	57.50 to 62.50
2. District Quartermaster		
Artisan	1	62.50
	8	per hr. .23 to .28
Cartman	1	47.50
Fireman	2	45.00 to 50.00
Foreman	17	62.50 to 80.00
Gardener	3	50.00
Janitor	108	35.00 to 47.50
Laborer	1	50.00
	113	per hr. .20 to .23
Messenger	4	35.00 to 60.00
Office Helper	17	45.00 to 80.00
Operator	5	47.50 to 50.00
Scavenger	10	10.00 to 50.00
Tailor	7	47.50 to 57.50
Watchman	4	45.00 to 52.50
3. Panama Canal Press		
Artisan	38	per hr. .23 to .30
Bookbinder	5	per hr. .30
Boy	4	22.50 to 32.50
Compositor	1	65.00
	7	per hr. .30
Foreman	3	75.00 to 80.00
Janitor	1	47.50
Laborer	5	per hr. .20
Office Helper	7	57.50 to 77.50
Printer	4	per hr. .30
Rubber Stamp Man	1	per hr. .30
Watchman	2	50.00
4. Storehouses and Oil Plants		
Artisan	7	per hr. .25
Blacksmith	1	57.50
Boy	2	22.50 to 25.00
Chauffeur	2	52.50 to 57.50
Checker	3	per hr. .30
Fireman	7	50.00 to 62.50

Foreman	7	52.50 to 75.00
Laborer	164	per hr. .20 to .25
Messenger	2	37.50
Office Helper	21	47.50 to 77.50
Oiler	6	per hr. .27
Rigger	8	per hr. .21
Storeman	18	45.00 to 62.50
Watchman	8	45.00 to 52.50
5. Transportation Division (Motor Car Shops)		
Artisan	4	60.00 to 72.50
	4	per hr. .23 to .28
Blacksmith	1	62.50
Boy	3	22.50 to 25.00
Chauffeur	112	47.50 to 62.50
Foreman	3	75.00 to 77.50
Helper	16	47.50 to 55.00
	5	per hr. .21 to .23
Laborer	3	42.50 to 55.00
	1	per hr. .20
Office Helper	6	52.50 to 80.00
Painter	1	62.50
Stableman	3	47.50
Storeman	2	57.50 to 60.00
Teamster	7	50.00
Upholsterer	5	62.50 to 72.50
Vulcanizer	2	55.00 to 62.50
Watchman	3	50.00 to 55.00
Wheelwright	1	65.00
6. Constructing Quartermaster Division		
Artisan	2	70.00 to 72.50
	436	per hr. .23 to .37
Boy	2	22.50
Foreman	1	72.50
Helper	2	per hr. .21
Laborer	29	per hr. .20
Messenger	1	35.00
Office Helper	4	47.50 to 80.00
Storeman	2	45.00
Watchman	2	47.50 to 52.50
7. Agronomist Division		
Gardener	1	42.50
Laborer	12	42.50 to 45.00
Nurseryman	1	62.50
Office Helper	1	77.50
Teamster	1	50.00

8. Hotel Tivoli

Artisan	7	per hr. .23 to .30
Attendant	2	$ 30.00 to 32.50
Baker	2	$ 47.50 to 67.50
Boy	9	$ 17.50 to 22.50
Butcher	1	$ 60.00
Cook	5	$ 40.00 to 67.50
(Chief)	1	$ 80.00
Chauffeur	1	$ 45.00
Checker	1	$ 55.00
Fireman	1	$ 65.00
Gardener	1	$ 47.50
Helper	7	$ 25.00 to 35.00
Housekeeper	1	$ 47.50
Janitor	8	$ 30.00 to 50.00
Laborer	2	$ 37.50
Maid	12	$ 20.00 to 25.00
Messenger	4	$ 30.00 to 42.50
Office Helper	4	$ 42.50 to 80.00
Operator	1	$ 55.00
Printer	1	per hr. $ .25
Saleswoman	2	37.50 to 50.00
Steward	1	$ 77.50
Storeman	1	$ 42.50
Telephone Operator	1	62.50
	2	$ 42.50 to 47.50
Waiter	15	$ 30.00 to 35.00
(Head)	4	$ 40.00 to 67.50
Watchman	1	$ 35.00

SCHEDULE II. THE WASHINGTON OFFICE

October 1, 1925

Units of Organization: *Classes of Employees*	*Number*	*Annual Salary Rate*
1. Purchasing Department		
General Purchasing Officer and Chief of Office	1	$6000.00
Chief Clerk	1	4400.00
Clerk	1	2900.00
	2	2600.00
	2	2400.00
	1	2300.00
	1	2100.00
	1	2040.00
	2	1980.00
	1	1860.00
	5	1800.00
	2	1740.00
	1	1680.00
	2	1620.00
	3	1560.00
	4 [5]	1440.00
Messenger	2	1140.00
Assistant Messenger	1	1020.00
	2	960.00
	1	900.00
2. Administrative Department		
Assistant to Chief of Office	1	4000.00
Chief of Division (Employment and Personnel)	1	3200.00
Draftsman	1	2800.00
Clerk	2	3000.00
	2	2400.00
	2	2300.00
	3	2040.00
	1	1920.00
	1	1860.00
	1	1800.00
	2	1740.00
	2	1500.00
	2	1200.00
Messenger	1	1140.00
	1	1080.00

[5] Two are stationed in Brooklyn, N. Y.

3. Accounting Department		
Assistant Auditor and Legal Adviser	1	5200.00
Disbursing Clerk	1	3500.00
Chief Clerk	1	3000.00
Clerk	1	2700.00
	1	2400.00
	2	2300.00
	1	2200.00
	3	1860.00
	1	1800.00
	1	1500.00
Messenger	1	1260.00
	1	1200.00
4. Inspection Force[6]		
Inspecting Engineer	1	5400.00
Inspector (Assistant to Inspecting Engineer)	1	3800.00
Inspector	1	3000.00
	1	2800.00
	1	2700.00
	2	2600.00
	4	2500.00
	3	2400.00
	2	2300.00
	4	2200.00
	1	2100.00

[6] The Inspectors are located at various points in the United States outside of the District of Columbia, except that the Inspecting Engineer, in charge of the force of inspectors, his assistant, and two or three inspectors are stationed in Washington.

APPENDIX 2

CLASSIFICATION OF ACTIVITIES

Explanatory Note

The Classifications of Activities in this series have for their purpose to list and classify in all practicable detail the specific activities engaged in by the several services of the national government. Such statements are of value from a number of standpoints. They furnish, in the first place, the most effective showing that can be made in brief compass of the character of the work performed by the service to which they relate. Secondly, they lay the basis for a system of accounting and reporting that will permit the showing of total expenditures classified according to activities. Finally, taken collectively, they make possible the preparation of a general or consolidated statement of the activities of the government as a whole. Such a statement will reveal in detail, not only what the government is doing, but the services in which the work is being performed. For example, one class of activities that would probably appear in such a classification is that of "scientific research." A subhead under this class would be "chemical research." Under this head would appear the specific lines of investigation under way and the services in which they were being prosecuted. It is hardly necessary to point out the value of such information in planning for future work and in considering the problem of the better distribution and coördination of the work of the government. The Institute contemplates attempting such a general listing and classification of the activities of the government upon the completion of the present series.

Classification of Activities

1. General Administration
    1. Intramural affairs, including
        1. Accounting
        2. Auditing

3. Payrolls
4. Personnel
    1. Recruitment
    2. Administration, involving
        1. Wage adjustments
        2. Grievance hearings
        3. Records
    3. Employees welfare [1]
        1. Recreation
5. Supplies
    1. Purchasing
    2. Storage and issue
    3. Sales of obsolete and unused materials
6. Records and files
7. Communication
    1. Correspondence and mails
    2. Telephone, telegraph, radio, and cable
    3. Messenger service
8. Drafting and charting
9. Preparation of annual and other reports

2. Courts [2]
    1. District
    2. Magistrate
3. Fortification and defense [2]

2. Primary Activities
    1. Transit of vessels
        1. Regulation of harbor approach requiring [1]
            1. Preliminary radio communication
            2. Direction for anchoring
            3. Dispatch of boarding party
        2. Inspection of vessels after anchoring with regard to [1]
            1. Dangerous cargo
            2. Defects in machinery or steering qualities
            3. Violations of United States laws at previous ports
            4. Claims against vessels

[1] This partakes of the nature of a governmental activity as well.
[2] Included only for administrative convenience. Not under the control of the Governor.

5. Communicable disease, sickness, and previous exposure to infection, especially smallpox, yellow fever, etc.
6. Violations of customs regulations.
7. Immigration and Oriental exclusion violations
8. Seamen's and passengers' welfare and comfort
9. Admeasurement and levy of tolls
10. Manifests and other papers

3. Detention of vessels guilty of violations
   1. Arrest or fine
   2. Correction of condition by fumigation, etc.
4. Clearing of eligible vessels for transit
5. Dispatch on schedule
6. Assistance in navigating canal
   1. Supplying pilot
   2. Towing sailing or disabled vessels through channel
   3. Lockages
   4. Furnishing lights and markers
7. Inspection of vessels on departure to determine whether[1]
   1. All documents and data are in order
   2. All laws have been completely obeyed
8. Granting of pratique or further detention if necessary

2. Operation and maintenance
   1. Water supply for lockages and lock power
      1. Meteorological and hydrographic work[1]
      2. Conservation of supply
         1. Operation of steam-electric plant
         2. Lock operation savings
            1. Short chamber lockages
            2. Cross filling
            3. Group or tandem lockages
         3. Eliminating leakage
         4. Controlling surges
         5. Manipulation of spillways
      3. Providing new sources of supply
      4. Maintenance of mains and other equipment

[1] This partakes of the nature of a governmental activity as well.

2. Channel maintenance
    1. Dredging
        1. Routine
        2. Slides
    2. Removal of obstructions
        1. Debris and wrecks
        2. Vegetable growths
    3. Improvement of prism contour
    4. Maintenance of aids to navigation
        1. Markers
        2. Lights
        3. Lighthouses
3. Lockages
    1. Prime operations
        1. Gate movements
        2. Water control
    2. Safety device operations
        1. Towing locomotives
        2. Fender chains
        3. Guard gates
        4. Emergency dams
    3. Maintenance of locks
        1. Use of floating caisson
            1. Painting
            2. Replacements and repairs
        2. Repainting, replacements, and repairs other than to chambers
4. Power generation and distribution
    1. Gatun hydro-electric plant
    2. Miraflores steam plant
    3. Sub-stations
    4. Maintenance of plants and transmission lines

3. Secondary Activities
    1. Business enterprises
        1. Transportation
            1. Direct services by Panama Railroad
                1. Passenger
                2. Freight

3. Express
4. Mail
5. Switching

2. Indirect services by Panama Railroad
   1. Storage
      1. Freight
      2. Baggage
   2. Telegraph
   3. Local transfer

3. Steamship lines
   1. Passenger, freight, and mail
   2. Coal
   3. Tramp
   4. Local transportation

2. Non-transportation
   1. Harbor terminals
      1. Loading, discharging, and interchanging cargoes
      2. Stevedoring
      3. Handling, transferring, and rehandling freight
      4. Wharfage and storage
   2. Fuel supply
      1. Coaling plants
         1. Storage
         2. Bunkering and loading
      2. Liquid fuel
         1. Storage
         2. Pumping
   3. Mechanical shops
      1. Marine work
         1. Dry docks
      2. Railroad work
      3. Other services
   4. Salvage operations
   5. Commissary system
      1. Hotels and restaurants
      2. Retail stores
      3. Dairy farm

4. Cattle raising
5. Plantations

6. Plant introduction gardens
   1. Experiments
   2. Propagation

7. Real estate operations
   1. Rental of quarters to employees
   2. Rental of land and buildings to non-employees
   3. Supplying of quarters for clubs, etc.

8. Storehouse operations
   1. Storage
   2. Sales
      1. Ship chandlery and supplies
      2. Other commodities

9. Building construction and repairs [8]

10. Electrical installation and maintenance
    1. Telephone and telegraph
    2. Railroad signals
    3. Private uses
       1. Power
       2. Lighting
    4. Municipal
       1. Lighting
       2. Fire alarm
    5. Marine work

11. Water supply
    1. Private use
    2. Ships

12. Miscellaneous
    1. Motor car repairs
    2. District quartermaster services
    3. Sand and gravel beds
    4. Sale of charts and publications
    5. Printing and paper
    6. Motor-boat sightseeing tours

[8] Heavy construction work done on request for outside interests.

2. Governmental duties
   1. Usually inhering to local government
      1. Public health
         1. Sanitation
            1. Ditching and drainage
            2. Filling
            3. Oiling
            4. Weed and refuse clearing
         2. General preventive work
            1. Child hygiene
            2. Vaccination
            3. Venereal clinics
            4. Fumigation
            5. General hygiene propaganda
         3. Institutional care
            1. Hospitals
            2. Leper colony
            3. Insane and feeble minded
            4. Cripples and indigent
         4. Laboratory testing
            1. Bacteriological work
            2. Chemical analyses
   2. Engineering and public works.
      1. Water supply for municipal and private use
         1. Reservoir maintenance
         2. Filtration and chemical treatment
            1. Testing laboratory
         3. Pumping
         4. Maintenance of mains
            1. General
            2. Fire supply
      2. Highway construction and maintenance
      3. Street cleaning
      4. Sewer construction and cleaning
      5. Garbage and refuse collection and disposal
         1. Dumping
         2. Incineration

6. Construction work[4]
   1. Building
      1. Drafting and design
      2. Grading, filling, landscaping
   2. Inspection

3. Safety
   1. Public order
      1. Police
         1. City service
         2. Rural patrol
         3. Harbor police
      2. Coroner
      3. Magistrate courts[5]
      4. Penal institutions
   2. Fire protection
      1. Prevention
      2. Extinguishment

4. Education
   1. Grade schools (white and colored)
   2. High schools (white)

5. Recreation[6]
   1. Playgrounds
   2. Clubhouses
   3. Athletic fields
   4. Swimming pool

2. Usually inhering to Federal Government
   1. Postal system
   2. Port duties[7]
      1. Customs
      2. Immigration
      3. Shipping commissioner service
      4. Admeasurement
      5. Steamboat-inspection service
      6. Maritime quarantine
      7. Prohibition enforcement
   3. Relations with Panama

[4] Lighter construction work, usually pertaining to quarters.
[5] Not under Governor except for appointment of magistrates.
[6] Included also under "Employees welfare."
[7] Included also under "Primary Activities."

APPENDIX 3

PUBLICATIONS

The publications of "The Panama Canal" are of two general types, those appearing periodically and those issued irregularly as conditions dictate. In general these publications are issued by the Panama Canal Press, but where the schedule of publication and economy so indicate the Government Printing Office at Washington is used.

Regular Publications. The publications issued periodically consist of the following:

1. Annual Report of the Governor of The Panama Canal[1]
2. Report of the Health Department of The Panama Canal
3. Annual Report of the Canal Zone Plant Introduction Gardens
4. The Panama Canal Record

Annual Report. The Annual Report of the Governor of "The Panama Canal," published by the Government Printing Office, is issued for the fiscal year ending June 30. It approximates 120 pages and is addressed to the Secretary of War.

It consists of five main sections: (1) Canal operation and trade via Panama, (2) Business operations, (3) Government, (4) Administration, and (5) Financial and statistical statements.

The reports of the heads of departments and divisions have not been printed since 1920, but are issued in typewritten form, and are on file at the Washington Office of "The Panama Canal" and at the office of the Governor, Balboa Heights, Canal Zone, where they may be consulted upon request.

[1] Previous to the fiscal year 1914 these reports were issued under the title Annual Report of the Isthmian Canal Commission.

These supplementary reports or appendices give a detailed account of operations, including charts, diagrams, and statistics. They consist, usually, of the following titles:

Engineer of Maintenance:
- Assistant engineer of maintenance, report of
- Pacific locks, report of superintendent
- Atlantic locks, report of superintendent
- Electrical division, report of electrical engineer
- Municipal engineering division, report of municipal engineer
- Dredging division, report of superintendent
- Office engineer
- Meteorology and hydrography, report of chief hydrographer
- Surveys, report of assistant engineer
- Gatun Dam and backfills, report of general foreman

Marine division, report of superintendent
Mechanical division, report of superintendent
Supply department, report of chief quartermaster
Executive department, report of executive secretary
- Division of civil affairs, report of chief of division
- Police and fire division, report of chief of division
- Division of schools, report of superintendent of schools
- Bureau of clubs and playgrounds, report of general secretary

District Attorney, report of
Accounting department, report of the auditor
Land agent, "The Panama Canal" and Panama Railroad Company, report of
Purchasing department, report of the general purchasing officer and chief of Washington Office

Health report. The Report of the Health Department of "The Panama Canal," unlike the departmental and divisional reports above listed, is issued in a separate printed form by the Panama Canal Press. Unlike other reports also it covers the calendar year.

The report normally contains about one hundred printed pages and is addressed to the Governor of "The Panama Canal." The report reviews the work of the year under the heads of sanitation, institutions, and quarantine activities, and includes complete and detailed vital statistics.

Plant Introduction. The Annual Report of the Canal Zone Plant Introduction Gardens is also issued in printed form. It is printed by the Panama Canal Press, consists normally of a dozen pages and is addressed to the Chief Quartermaster. The report reviews the activities of the Farm Bureau for the fiscal year.

Panama Canal Record. The Panama Canal Record is the official current publication of "The Panama Canal" and is printed weekly by the Panama Canal Press, being entered as second class matter in the post office. It is serially numbered, a volume including the issue of each year beginning in August.[2] The pagination is continuous for a volume, the issues varying from eight to twenty-five or thirty pages, without cover.

The contents include current and summary statistical data with regard to traffic and movements of ocean vessels and in addition news items of interest, official notices, and standing information[3] with regard to "Canal" facilities, rates, etc.

Panama Railroad. The Annual Report of the Board of Directors of the Panama Railroad, though issued for the fiscal year, is privately printed and hence is not included in the list just discussed. It constitutes the official report of the railroad company, which is a corporation of the State of New York, all the stock of which is owned by the United States Government.

The report is addressed to the stockholders of the company by the President of the Panama Railroad Company, who is also Governor of "The Panama Canal." In some forty pages it reviews the activities of the corporation for the year, and includes financial statements, statistics, and a chart.

Occasional Publications. The remaining publications of "The Panama Canal" are issued from time to time, certain ones being revisions of pamphlets which are reprinted as necessity dictates, others being kept up to date by the issuance of supplements as changes occur. This list includes:

Treaties and acts of Congress relating to the Panama Canal
Executive orders relating to the Panama Canal
Tariff No. 8—The Panama Canal
Steamships lines through the Panama Canal
Rules and regulations governing navigation of the Panama Canal and adjacent waters
Quarantine laws and regulations
Manual of information
General information

[2] Subscription rates: 50 cents per annum domestic, $1.00 foreign.

[3] The same information is not published in each issue, but each item appears a number of times during the year. In short, there is a rotation governed somewhat by space requirements.

Treaties and Acts. "Treaties and Acts of Congress relating to The Panama Canal—Annotated—1921" explains the contents by the title. This volume is published by the Panama Canal Press and consists of 258 pages, and (at present) seven loose-leaf supplements with continuous pagination running to 337 (Price $1.00).

The volume includes six sections, as follows:

Chronological list of treaties relating to the Panama Canal
Chronological list of acts of Congress relating to the Panama Canal
Introductory and explanatory note
Text of treaties relating to the Panama Canal
Pertinent text of acts of Congress relating to the Panama Canal
Index

The supplements, issued as needed, duplicate the above outline of contents except for the index.

Executive Orders. "Executive Orders Relating to The Panama Canal—Annotated—1921" is similar in purpose and make up to "Treaties and Acts." It contains executive orders[4] from March 8, 1904, to December 31, 1921. In addition ten supplements have been published. Publication is by the Panama Canal Press. The original volume contains 332 pages, the pagination being continuous in the supplements up to page 374. The contents include:

Chronological list of executive orders relating to the Panama Canal
Introduction and explanatory note
Text of executive orders, proclamations, and letters relating to the Panama Canal
Index

The supplements, issued as needed, duplicate the above outline of contents except for the index.

Tariff Number 8. "The Panama Canal (Tariff No. 8)" contains a schedule of rates for supplies and services furnished to shipping and allied interests at the Panama Canal.[5] It is published by the Panama Canal Press, and is kept up to date by supplements

[4] Also certain letters of instruction, and proclamations both of the President and the Secretary of War. Price $1.00.

[5] This supersedes Tariff No. 7 and all supplements and is effective as of July 1, 1925.

and new issues. It contains fifty-eight pages. Three supplements have been issued.

Steamship Lines. The pamphlet entitled "Steamship Lines through the Panama Canal and to its Terminal Ports and Passenger Connections from the Panama Canal" gives sufficient indication of its scope by the title. It is published by the Panama Canal Press, the latest issue being dated October, 1925, and contains nineteen pages.

Rules and Regulations. "Rules and Regulations governing Navigation of the Panama Canal and Adjacent Waters" again reveals scope by its title.

The contents include the text of various regulations under the following chapter headings:

General
Arriving and Departing Vessels
Admeasurement and Tolls
Pilots
Requirements Concerning Officers, Crew, Equipment and Passengers
Navigation in Canal Harbors
Accidents and Claims
Quarantine
Exclusion of Undesirables
Exclusion of Chinese
Customs Administration
Vessel Inspection Service
Radio Communication
Miscellaneous
Information
1. Port Captains
2. Signals and Signal Stations
3. Services and Supplies
4. Mails
5. General

These regulations, based on executive orders, have the force of law. They, with an index, occupy eighty-four pages, the latest issue being published in 1925 by the Panama Canal Press.

Quarantine Laws and Regulations. Once more the contents of the publication is revealed by the title, "Quarantine Laws and Regulations for the Canal Zone and the Harbors of the Cities of Panama and Colon, and Republic of Panama."

This pamphlet of thirty-four pages, including an index, is published by the Panama Canal Press. The latest issue was in 1920.

Manual of Information. "The Manual of Information concerning Employments for the Panama Canal Service" (Revised December 1, 1923) outlines the qualifications and requirements for the various positions in "The Canal" service. It is a general guide to applicants and is revised as conditions dictate. The Manual is published by the Panama Canal Press and contains twenty-four pages.

General Information. "General Information—The Panama Canal" is a pocket size pamphlet of sixteen pages with half-tone illustrations, printed by the Panama Canal Press. It is, according to a statement on its first page, "published by the United States Government as a concise summary of information about the Canal in all its principal aspects and for the special assistance of visitors to the Canal Zone."[6]

All of the pamphlets here described as supplying information in the way of rules, regulations, tariffs, and the like, are supplemented, informally by the current numbers of the Panama Canal Record, which publishes all circulars of "The Canal" as issued.

Miscellaneous. The miscellaneous publications of "The Panama Canal" include those which are neither periodical in issue nor kept up to date by regular revision or supplement. Most of these now are of value in studying the history of "The Canal" but do not apply to present conditions. Two exceptions are: "A great people's great canal," and "The maintenance and operation of the Panama Canal."

The first of these, in addition to the title mentioned bears a subtitle—"Its achievements—Its perils." It is a reprint by the Panama Canal Press of an article published in the "Outlook" for February 28, 1923, by Col. Jay J. Morrow, then Governor of "The Panama Canal." It contains sixteen pages and is a plea written in a popular style, to preserve the autonomy of "Canal" administration.

The second pamplet, likewise by ex-Governor Morrow, is a reprint of a lecture delivered before the New York Section, American Society of Civil Engineers, January 10, 1923, and repeated before the Society of Civil Engineers of Washington, D. C., January 17, 1923. It is a forty-four page publication by the Panama Canal Press and constitutes a general non-technical description of "Canal" maintenance and operation.

In addition to the above, Governor's Circulars are published by the Panama Canal Press. These are a medium for the announcement by the Governor's orders and regulations and are similar to the executive orders of the President, but on a smaller scale.

[6] Priced at 3 cents each for extra copies. Last issued in February, 1926.

APPENDIX 4

PLANT AND EQUIPMENT

(Including the Portion of Capital Outlay Charged to Defense)

I—Canal Fixed Property	*Defense*	*Operation*	*Total*
Channels	.....	.....	$137,362,744.89
Gatun to Sea	$237,482.88	$11,636,700.00	.....
Gatun to Pedro-Miguel	2,141,358.67	104,926,542.00	.....
Pedro-Miguel to Sea	388,049.34	18,032,612.00	.....
Locks	.....	.....	75,562,652.03
Gatun	1,203,953.05	34,879,054.93	.....
Pedro-Miguel	638,599.30	15,376,336.10	.....
Miraflores	867,655.23	22,597,053.42	.....
Spillways	.....	.....	5,401,906.81
Gatun	99,317.86	3,982,199.00	.....
Miraflores	[a]89,133.95	1,231,256.00	.....
Floating Caisson	20,872.15	326,996.00	347,868.15
Dams	.....	.....	12,431,659.49
Alhajuela	.....	61,950.49	.....
Gatun	196,462.60	9,626,678.00	.....
Gatun—Mindi Levee	2,813.01	137,822.00	.....
Trinidad River	1,328.47	65,057.00	.....
Pedro-Miguel	8,633.66	423,070.00	.....
Miraflores	23,195.78	1,136,594.00	.....
La Boca locks and dams	[b]748,054.48	.....	.....
Breakwaters	.....	.....	9,062,077.94
Colon	3,856,618.16	4,189,810.00	.....
Naos Island	20,312.78	995,337.00	.....
Entrance Basin—Balboa	489,480.39	.....	489,480.39
Inner Harbor	.....	.....	3,502,308.47
Balboa	3,265,207.04	.....	.....
Cristobal	237,101.43	.....	.....
Aids to Navigation	93,388.54	832,820.81	926,209.35
Purchase Toro Point Light	15,000.00	.....	15,000.00
Roads, Sts., and Sidewalks	610,956.00	1,002,675.77	1,613,631.77
Storm Sewers	298,284.69	200,000.00	498,284.69
Fluviographs	3,427.02	.....	3,427.02
Street Lighting System	.....	99,236.44	99,236.44
Office Buildings	.....	.....	1,616,575.66
Administration	306,211.51	918,636.00	.....
Terminal Office, Balboa	.....	77,409.00	.....
Storehouses	2,547.15	300,000.00	.....
Hydrographic Structures	.....	11,772.00	.....

[a] Including east dam.
[b] Abandoned.

I—Canal Fixed Property	*Defense*	*Operation*	*Total*
Health Department Buildings	.....	.....	2,872,064.29
Ancon Hospital	435,325.80	1,305,975.00	.....
Colon Hospital	63,876.90	191,630.00	.....
Dispensaries	40,303.97	120,910.00	.....
Asylums	128,506.16	128,471.49	.....
Quarantine stations	40,129.48	40,129.00	.....
Other Buildings	.....	58,507.00	.....
Balboa incinerator	100,000.00	.....	.....
Cristobal incinerator	.....	88,474.55	.....
Miscellaneous	129,824.94	.....	.....
Permanent Townsites	.....	.....	1,176,838.22
Ancon-Balboa	596,596.73	.....	.....
La Boca	123,206.13	.....	.....
Red Tank	2,614.43	.....	.....
Pedro-Miguel	96,797.08	.....	.....
Gatun	1,776.56	.....	.....
Cristobal	355,847.29	.....	.....
Sanitary fills	636,732.11	.....	636,732.11
Sanitary ditches	199,706.53	.....	199,706.53
Civil Government	.....	.....	889,474.15
Schoolhouses	49,227.23	443,044.00	.....
Post Offices	26,987.62	8,995.00	.....
Fire Stations	.....	21,644.00	.....
Police Stations and Prisons	.....	19,870.00	.....
Courthouses	116,409.89	74,896.00	.....
Clubs and Playgrounds..	13,902.41	114,498.00	.....
Canal Construction and flood areas	991,707.06	.....	991,707.06
Auxiliary works and buildings	146,258.94	.....	146,258.94
Depopulation of Canal Zone	2,336,889.63	.....	2,336,889.63
Joint land commission expenses	356,006.61	.....	356,006.61
Purchase from New Panama Canal Co.....	38,717,335.97	.....	38,717,335.97
Investment Panama R. R. Stock	155,881.24	.....	155,881.24
Concession from Republic of Panama	10,000,000.00	.....	10,000,000.00
Relocation of Panama R. R.	9,800,626.46	.....	9,800,626.46
Presentation of launch to French Government ..	13,500.00	.....	13,500.00
Canal protection 1917-18...	25,236.79	.....	25,236.79
Equipment and property transferred to and from other Government departments	1,970,877.33	.....	1,970,877.33
Construction equipment ...	3,020,090.65	.....	3,020,090.65

I—Canal Fixed Property	*Defense*	*Operation*	*Total*
Construction material and supplies	2,225,000.00	.....	2,225,000.00
Loans to Panama R. R. Co.	3,247,332.11	.....	3,247,332.11
Grand Total	$92,029,896.19	$235,684,662.00	$327,714,558.19
II—Canal Transit Equipment			
Floating Equipment	.....	.....	3,975,795.36
Tugs	.....	$790,213.73	.....
Supply boats	.....	51,544.48	.....
Launches	.....	178,265.14	.....
Dredges	.....	1,186,516.60	.....
Barges	.....	965,812.66	.....
Floating Cranes	.....	656,792.45	.....
Crane boat	.....	30,000.00	.....
Graders	.....	28,690.30	.....
Drill barge	.....	15,000.00	.....
Compressor barge	.....	20,848.00	.....
Coal hoist barge	.....	2,112.00	.....
Relay pump barge	.....	50,000.00	.....
Other equipment	.....	.....	41,847.10
Road rollers	.....	13,786.00	.....
Automobiles	.....	2,651.23	.....
Excavators	.....	17,370.00	.....
Machinery tools	.....	8,039.87	.....
Grand Total	.....	$4,017,642.46	$4,017,642.46
III—Business Fixed Property			
Electrical Division	.....	.....	6,287,629.31
Hydroelectric plant	.....	$1,669,265.12	.....
Miraflores steam plant	.....	308,270.31	.....
Substations	.....	1,841,045.18	.....
Transmission system	$10,055.46	1,355,733.38	.....
Distribution lines	.....	1,103,259.86	.....
Municipal Engineering Division	.....	.....	3,129,372.54
Panama Water System	40,697.58	1,760,062.67	.....
Miraflores Lake pump station	.....	19,500.00	.....
Colon water system	.....	585,642.89	.....
Zone water system	155,190.03	568,279.37	.....
Public Works, Panama	.....	.....	[c] 1,469,266.45
Water works and sewers	.....	876,353.22	.....
Pavements	.....	592,913.23	.....
Public Works, Colon	.....	.....	[d] 1,249,502.71
Water works and sewers	.....	623,883.68	.....
Pavements	.....	625,619.03	.....

[c] Includes payments and withdrawals of $444,429.58.
[d] Includes payments and withdrawals of $381,105.06.

III—Business Fixed Property	*Defence*	*Operation*	*Total*
Shops and Dry Docks....	.....	.....	9,424,952.90
Dry Dock, Balboa	3,376,647.49	.....	.....
Preparatory work, Balboa terminals	1,808,921.65	.....	.....
Dry Dock, Cristobal....	23,475.51	50,000.00	.....
Cristobal Shops	164,147.93	.....	.....
Roundhouse, Balboa	.....	111,500.00	.....
Car and paint shops, Balboa	3,795,260.32	95,000.00	.....
Steamships	.....	.....	1,600,000.00
Panama	.....	400,000.00	.....
Ancon	.....	600,000.00	.....
Cristobal	.....	600,000.00	.....
Docks, Wharves and Piers.	.....	.....	4,995,570.64
Terminal Office Bldg., Balboa	3,225.42	.....	.....
Pier 18, Balboa	1,590,160.35	1,168,200.26	.....
Pier 6, Cristobal.....	1,033,984.61	1,200,000.00	.....
Coaling Plant	.....	.....	5,964,365.94
Cristobal	3,179,797.59	500,000.00	.....
Balboa	2,284,568.35	.....	.....
Colliers and Coal Barges...	.....	.....	3,629,232.00
Colliers	.....	2,029,232.00	.....
Coal barges	.....	1,600,000.00	.....
Shops and Store Office....	238,553.94	.....	238,553.94
Fuel Oil Plants.....	.....	.....	1,077,828.58
Balboa	.....	458,860.58	.....
Cristobal	.....	618,968.00	.....
Business storehouses	475,934.74	300,000.00	775,934.74
Animal and motor transportation	.....	14,285.00	14,285.00
Motor car repair shop.....	.....	16,633.32	16,633.32
Building repairs and construction	.....	11,690.00	11,690.00
Gold quarters	1,351,269.07	3,428,150.71	4,779,419.78
Silver quarters	269,685.74	616,906.00	886,591.74
Miscellaneous buildings ..	543,700.28	.....	543,700.28
Garages	.....	83,524.76	83,524.76
Boathouses	.....	4,000.00	4,000.00
Hotel Tivoli	.....	161,258.13	161,258.13
Restaurants	*242,909.87	198,350.00	441,259.87
Grand Total	$20,588,185.93	$26,196,386.70	$46,784,572.63
IV—Canal Business Equipment			
Electric Light and Power System	.....	.....	$8,997.62
Machinery and tools....	.....	$8,116.90	.....
Automobiles	.....	880.72	.....

* Hotels and Restaurants included.

IV—Canal Business Equipment	*Defense*	*Operation*	*Total*
Electric Work			19,612.35
Machinery and tools		14,580.58	
Automobiles		5,031.77	
Telephone and Telegraph Work			6,321.79
Machinery and tools		6,321.79	
Water System			25,219.44
Machinery and tools		25,219.44	
Municipal Engineering Work			33,374.64
Machinery and tools		27,120.56	
Automobiles		6,254.08	
Shops and Dry Docks			362,061.74
Machinery and tools		362,061.74	
Fuel Oil Plants			6,771.46
Machinery and tools		6,771.46	
Animal and Motor Transportation			230,401.35
Machinery and tools		2,958.67	
Automobiles		224,086.05	
Mules		3,356.63	
Motor Car Repair Shop			13,607.07
Machinery and tools		13,607.07	
Building Repair and Construction			9,146.57
Machinery and tools		9,146.57	
Panama Canal Press			19,611.86
Machinery and tools		19,611.86	
Restaurants			30,420.16
Machinery and tools		30,420.16	
Hotel Aspinwall			9,555.06
Machinery and tools		9,555.06	
Lands rented			2,260.86
Machinery and tools		1,174.10	
Mules		1,086.76	
Grand Total		$777,361.97	$777,361.97
V—Panama Railroad Plant and Equipment			
Floating Equipment			$2,297,870.45
Steamships			
Gen. G. W. Goethals		$199,984.28	
Gen. W. C. Gorgas		204,791.24	
Gen. O. H. Ernst		198,890.64	
Ancon		357,316.06	
Cristobal		1,217,434.71	
Lake Flattery		113,564.15	
Launches		1,747.23	
Miscellaneous		4,142.14	

V—Panama Railroad Plant and Equipment	*Defense*	*Operation*	*Total*
Land, Plant and Equipment and Miscellaneous	.....	.....	$28,545,939.41
Railroad and appurtenances	.....	$10,998,254.45	.....
Docks, piers, wharves and appurtenances	.....	5,162,158.11	.....
Coal plants	.....	1,087,690.37	.....
Commissary plants and stores	.....	2,164,400.23	.....
Telephone system	.....	654,040.82	.....
Hotel Washington	.....	744,610.60	.....
Real Estate	.....	6,755,970.18	.....
Dairy Farm	.....	93,737.48	.....
Cattle Industry	.....	721,033.62	.....
Stables, Colon	.....	94,685.00	.....
Baggage Transfer Equipment	.....	4,479.11	.....
Plantations	.....	40,457.14	.....
Storage battery trucks and trailers, N. Y. terminals	.....	20,277.48	.....
Motor car (Haiti)	.....	2,056.00	.....
Concession from Colombia	.....	1.00	.....
Coal crushing and sampling plant (Lamberts Point, Va)	.....	2,087.82	.....
Grand Total	.....	$30,843,809.86	$30,843,809.86

VI—Locomotive and Car Equipment	*Stored*	*Active*	*Total*
Locomotives	.....	.....	24
Road	.....	12	.....
Switch	.....	12	.....
Freight Cars	.....	.....	1071
Caboose	2	6	.....
Refrigerator	.....	27	.....
Gondola	.....	78	.....
Box	89	381	.....
Stock	.....	25	.....
Flat	.....	218	.....
Ballast	.....	20	.....
Dump (Oliver)	.....	151	.....
(Lidgerwood)	.....	12	.....
Work	.....	4	.....
Oil Tank	.....	6	.....
Labor box	.....	14	.....
Banana	.....	38	.....

VI—Locomotive and Car Equipment	*Stored*	*Active*	*Total*
Passenger Cars	.....	.....	62
Motor	.....	2	.....
Motor trailer	.....	1	.....
Parlor Chair	.....	3	.....
First class	.....	17	.....
Second class	.....	14	.....
Passenger box	.....	16	.....
Baggage and mail	.....	7	.....
Hospital	.....	1	.....
Pay	.....	1	.....
Miscellaneous	.....	.....	7
Pile Driver	1	.....	.....
Cranes	.....	3	.....
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(B) Compilation of Laws

1912—Act of August 24, 1912 (37 Stat. L., 560)—An Act To provide for the opening, maintenance, protection and operation of the Panama Canal and the sanitation and government of the Canal Zone.

[Section 1]. That the zone of land and land under water of the width of ten miles extending to the distance of five miles on each side of the center line of the route of the canal now being constructed thereon, which zone begins in the Carribean Sea three marine miles from mean low-water mark and extends to and across the Isthmus of Panama into the Pacific Ocean to the distance of three marine miles from mean low-water mark, excluding therefrom the cities of Panama and Colon and their adjacent harbors located within said zone, as excepted in the treaty with the Republic of Panama dated November eighteenth, nineteen hundred and three, but including all islands within said described zone, and in addition thereto the group of islands in the Bay of Panama named Perico, Naos, Culebra, and Flamenco, and any lands and waters outside of said limits above described which are necessary or convenient for the construction, maintenance, operation, sanitation, or protection of the said canal, or of any auxiliary canals, lakes, or other works necessary or convenient for the construction, maintenance, operation, sanitation, or protection of said canal, the use, occupancy, or control whereof were granted to the United States by the treaty between the United States and the Republic of Panama, the ratifications of which were exchanged on the twenty-sixth day of February, nineteen hundred and four, shall be known and designated as the Canal Zone, and the canal now being constructed thereon shall hereafter be known and designated as the Panama Canal. The President is authorized, by treaty with the Republic of Panama, to acquire any additional land or land under water not already granted, or which was excepted from the grant, that he may deem necessary for the operation, maintenance, sanitation, or protection of the Panama Canal, and to exchange any land or land under water not deemed necessary for such purposes for other land or land under water which may be deemed necessary for such purposes, which additional land or land under water so acquired shall become part of the Canal Zone.

Sec. 2. That all laws, orders, regulations, and ordinances adopted and promulgated in the Canal Zone by order of the President for the government and sanitation of the Canal Zone and the construction of the Panama Canal are hereby ratified and confirmed as valid and binding until Congress shall otherwise provide. The existing courts established in the Canal Zone by Executive order are recognized and confirmed to continue in operation until the courts provided for in this Act shall be established.

Sec. 3. That the President is authorized to declare by Executive order that all land and land under water within the limits of the Canal Zone is necessary for the construction, maintenance, operation, sanitation, or protection of the Panama Canal, and to extinguish, by agreement when advisable, all claims and titles of adverse claimants and occupants. Upon failure to secure by agreement title to any such parcel of land or land under water the adverse claim or occupancy shall be disposed of and title thereto secured in the United States and compensation therefor fixed and paid in the manner

provided in the aforesaid treaty with the Republic of Panama, or such modification of such treaty as may hereafter be made.

SEC. 4. That when in the judgment of the President the construction of the Panama Canal shall be sufficiently advanced toward completion to render the further services of the Isthmian Canal Commission unnecessary the President is authorized by Executive order to discontinue the Isthmian Canal Commission, which, together with the present organization, shall then cease to exist; and the President is authorized thereafter to complete, govern, and operate the Panama Canal and govern the Canal Zone, or cause them to be completed, governed, and operated, through a governor of the Panama Canal and such other persons as he may deem competent to discharge the various duties connected with the completion, care, maintenance, sanitation, operation, government, and protection of the canal and Canal Zone. If any of the persons appointed or employed as aforesaid shall be persons in the military or naval service of the United States, the amount of the official salary paid to any such person shall be deducted from the amount of salary or compensation provided by or which shall be fixed under the terms of this Act. The governor of the Panama Canal shall be appointed by the President, by and with the advice and consent of the Senate, commissioned for a term of four years and until his successor shall be appointed and qualified. He shall receive a salary of ten thousand dollars a year. All other persons necessary for the completion, care, management, maintenance, sanitation, government, operation, and protection of the Panama Canal and Canal Zone shall be appointed by the President, or by his authority, removable at his pleasure, and the compensation of such persons shall be fixed by the President, or by his authority, until such time as Congress may by law regulate the same, but salaries or compensation fixed hereunder by the President shall in no instance exceed by more than twenty-five per centum the salary or compensation paid for the same or similar services to persons employed by the Government in continental United States. That upon the completion of the Panama Canal the President shall cause the same to be officially and formally opened for use and operation.

Before the completion of the canal, the Commission of Arts may make report to the President of their recommendation regarding the artistic character of the structures of the canal, such report to be transmitted to Congress.

SEC. 5. That the President is hereby authorized to prescribe and from time to time change the tolls that shall be levied by the Government of the United States for the use of the Panama Canal: *Provided*, That no tolls, when prescribed as above, shall be changed, unless six months' notice thereof shall have been given by the President by proclamation. No tolls shall be levied upon vessels engaged in the coastwise trade of the United States.[1] That section forty-one hundred and thirty-two of the Revised Statutes is hereby amended to read as follows:

"SEC. 4132. Vessels built within the United States and belonging wholly to citizens thereof; and vessels which may be captured in war by citizens of the United States and lawfully condemned as prize, or which may be adjudged to be forfeited for a breach of the laws of the United States; and seagoing vessels, whether steam or sail, which have been certified by the Steamboat Inspection Service as safe to carry dry and perishable cargo, not more than five years old at the time they apply for registry, wherever

[1] This sentence was repealed by the act of June 15, 1914.

built, which are to engage only in trade with foreign countries or with the Philippine Islands and the islands of Guam and Tutuila, being wholly owned by citizens of the United States or corporations organized and chartered under the laws of the United States of any State thereof, the president and managing directors of which shall be citizens of the United States or corporations organized and chartered under the laws of the United States or of any State thereof, the President and managing directors of which shall be citizens of the United States, and no others may be registered as directed in this title. Foreign-built vessels registered pursuant to this Act shall not engage in the coastwise trade: *Provided,* That a foreign-built yacht, pleasure boat, or vessel not used or intended to be used for trade admitted to American registry pursuant to this section shall not be exempt from the collection of ad valorem duty provided in section thirty-seven of the Act approved August fifth, nineteen hundred and nine, entitled 'An Act to provide revenue, equalize duties, and encourage the industries of the United States, and for other purposes.' That all materials of foreign production which may be necessary for the construction or repair of vessels built in the United States, and all such materials necessary for the building or repair of their machinery and all articles necessary for their outfit and equipment may be imported into the United States free of duty under such regulations as the Secretary of the Treasury may prescribe: *Provided, further,* That such vessels so admitted under the provisions of this section may contract with the Postmaster General under the Act of March third, eighteen hundred and ninety-one, entitled "An Act to provide for ocean mail service between the United States and foreign ports, and to promote commerce," so long as such vessels shall in all respects comply with the provisions and requirements of said act."

Tolls may be based upon gross or net registered tonnage, displacement tonnage, or otherwise, and may be based on one form of tonnage for warships and another for ships of commerce. The rate of tolls may be lower upon vessels in ballast than upon vessels carrying passengers or cargo. When based upon net registered tonnage or ships of commerce the tolls shall not exceed one dollar and twenty-five cents per net registered ton, nor be less, other than for vessels of the United States and its citizens,[2] than the estimated proportionate cost of the actual maintenance and operation of the canal, subject however, to the provisions of article nineteen of the convention between the United States and the Republic of Panama, entered into November eighteenth, nineteen hundred and three. If the tolls shall not be based upon net registered tonnage, they shall not exceed the equivalent of one dollar and twenty-five cents per net registered ton as nearly as the same may be determined, nor be less than the equivalent of seventy-five cents per net registered ton. The toll for each passenger shall not be more than one dollar and fifty cents. The President is authorized to make and from time to time amend regulations governing the operation of the Panama Canal, and the passage and control of vessels through the same or any part thereof, including the locks and approaches thereto, and all rules and regulations affecting pilots and pilotage in the canal or the approaches thereto through the adjacent waters.

Such regulations shall provide for prompt adjustment by agreement and immediate payment of claims for damages which may arise from injury to

[2]Amended by the act of June 15, 1914.

vessels, cargo, or passengers from the passing of vessels, through the locks under the control of those operating them under such rules and regulations. In case of disagreement suit may be brought in the district court of the Canal Zone against the governor of the Panama Canal. The hearing and disposition of such cases shall be expedited and the judgment shall be immediately paid out of any moneys appropriated or allotted for canal operation.

The President shall provide a method for the determination and adjustment of all claims arising out of personal injuries to employees thereafter occurring while directly engaged in actual work in connection with the construction, maintenance, operation, or sanitation of the canal or of the Panama Railroad, or of any auxiliary canals, locks, or other works necessary and convenient for the construction, maintenance, operation or sanitation of the canal whether such injuries result in death or not, and prescribe a schedule of compensation therefor, and may revise and modify such method and schedule at any time; and such claims, to the extent they shall be allowed on such adjustment, if allowed at all, shall be paid out of the moneys hereafter appropriated for that purpose or out of the funds of the Panama Railroad Company, if said company was responsible for said injury, as the case may require. And after such method and schedule shall be provided by the President, the provisions of the Act entitled "An Act granting to certain employees of the United States the right to receive from it compensation for injuries sustained in the course of their employment," approved May thirtieth, nineteen hundred and eight, and of the Act entitled "An Act relating to injured employees on the Isthmian Canal," approved February twenty-fourth, nineteen hundred and nine, shall not apply to personal injuries, thereafter received and claims for which are subject to determination and adjustment as provided in this section.

Sec. 6. That the President is authorized to cause to be erected, maintained, and operated, subject to the International Convention and the Act of Congress to regulate radio-communication, at suitable places along the Panama Canal and the coast adjacent to its two terminals, in connection with the operation of said canal, such wireless telegraphic installations as he may deem necessary for the operation, maintenance, sanitation, and protection of said canal, and for other purposes. If it is found necessary to locate such installations upon territory of the Republic of Panama, the President is authorized to make such agreement with said Government as may be necessary, and also to provide for the acceptance and transmission, by said system, of all private and commercial messages, and those of the Government of Panama, on such terms and for such tolls as the President may prescribe. *Provided,* That the messages of the Government of the United States and the departments thereof, and the management of the Panama Canal, shall always be given precedence over all other messages. The President is also authorized in his discretion, to enter into such operating agreements or leases with any private wireless company or companies as may best insure freedom from interference with the wireless telegraphic installations established by the United States. The President is also authorized to establish, maintain, and operate, through the Panama Railroad Company or otherwise, dry docks, repair shops, yards, docks, wharves, warehouses, storehouses and other necessary facilities and appurtenances for the purpose of providing coal and other materials, labor, repairs, and supplies for vessels of the Government of the United States and, incidentally, for supplying such

at reasonable prices to passing vessels, in accordance with appropriations hereby authorized to be made from time to time by Congress as a part of the maintenance and operation of the said canal. Moneys received from the conduct of said business may be expended and reinvested for such purposes without being covered into the Treasury of the United States; and such moneys are hereby appropriated for such purposes, but all deposits of such funds shall be subject to the provisions of existing law relating to the deposit of other public funds of the United States, and any net profits accruing from such business shall annually be covered into the Treasury of the United States. Monthly reports of such receipts and expenditures shall be made to the President by the persons in charge, and annual reports shall be made to the Congress.

SEC. 7. That the governor of the Panama Canal shall, in connection with the operation of such canal, have official control and jurisdiction over the Canal Zone and shall perform all duties in connection with the civil government of the Canal Zone, which is to be held, treated and governed as an adjunct of such Panama Canal. Unless in this Act otherwise provided all existing laws of the Canal Zone referring to the civil governor or the civil administration of the Canal Zone shall be applicable to the governor of the Panama Canal, who shall perform all such executive and administrative duties required by existing law. The President is authorized to determine or cause to be determined what towns shall exist in the Canal Zone and subdivide and from time to time resubdivide said Canal Zone into subdivisions, to be designated by name or number, so that there shall be situated one town in each subdivision, and the boundaries of each subdivision shall be clearly defined. In each town there shall be a magistrate's court with exclusive original jurisdiction coextensive with the subdivision in which it is situated of all civil cases in which the principal sum claimed does not exceed three hundred dollars, and all criminal cases wherein the punishment that may be imposed shall not exceed a fine of one hundred dollars, or imprisonment not exceeding thirty days, or both, and all violations of police regulations and ordinances and all actions involving possession or title to personal property or the forcible entry and detainer of real estate. Such magistrates shall also hold preliminary investigations in charges of felony offences under section ten of this Act, and commit or bail in bailable cases to the district court. A sufficient number of magistrates and constables, who must be citizens of the United States, to conduct the business of such courts, shall be appointed by the governor of the Panama Canal for terms of four years and until their successors are appointed and qualified, and the compensation of such persons shall be fixed by the President, or by his authority, until such time as Congress may by law regulate the same. The rules governing said courts and prescribing the duties of said magistrates and constables, oaths and bonds, the times and places of holding such courts, the disposition of fines, costs, forfeitures, enforcements of judgments, providing for appeal therefrom to the district court, and the disposition treatment, and pardon of convicts shall be established by order of the President. The governor of the Panama Canal shall appoint all notaries public, prescribe their powers and duties, their official seal, and the fees to be charged and collected by them.

SEC. 8. That there shall be in the Canal Zone one district court with two divisions, one including Balboa and the one including Cristobal; and one district judge of the said district, who shall hold his court in both divisions

at such time as he may designate by order, at least once a month in each division. The rules of practice in such district court shall be prescribed or amended by order of the President. The said district court shall have original jurisdiction of all felony cases, of offenses arising under section ten of the Act, all causes in equity; admiralty and all cases at law involving principal sums exceeding three hundred dollars and all appeals from judgments rendered in magistrates' courts. The jurisdiction in admiralty herein conferred upon the district judge and the district court shall be the same that is exercised by the United States judges and the United States district courts, and the procedure and practice shall also be the same. The district court or the judge thereof shall also have jurisdiction of all other matters and proceedings not herein provided for which are now within the jurisdiction of the Supreme Court of the Canal Zone, of the Circuit Court of the Canal Zone, the District of the Canal Zone, or the judges thereof. Said judge shall provide for the selection, summoning, serving, and compensation of jurors from among the citizens of the United States, to be subject to jury duty in either division of such district, and a jury shall be had in any criminal case or civil case at law originating in said court on the demand of either party. There shall be a district attorney and a marshal for said district. It shall be the duty of the district attorney to conduct all business, civil and criminal, for the Government, and to advise the governor of the Panama Canal on all legal questions touching the operation of the canal and the administration of civil affairs. It shall be the duty of the marshal to execute all process of the court, preserve order therein, and do all things incident to the office of marshal. The district judge, the district attorney, and the marshal shall be appointed by the President, by and with the advice and consent of the Senate, for terms of four years each, and until their successors are appointed and qualified, and during their terms of office shall reside within the Canal Zone, and shall hold no other office nor serve on any official board or commission nor receive any emoluments except their salaries. The district judge shall receive the same salary paid the district judges of the United States, and shall appoint the clerk of said court, and may appoint one assistant when necessary, who shall receive salaries to be fixed by the President. The district judge shall be entitled to six weeks' leave of absence each year with pay. During his absence or during any period of disability or disqualification from sickness or otherwise to discharge his duties the same shall be temporarily performed by any circuit or district judge of the United States who may be designated by the President, and who, during such service, shall receive the additional mileage and per diem allowed by law to district judges of the United States when holding court away from their homes. The district attorney and the marshal shall be paid each a salary of five thousand dollars per annum.

Sec. 9. That the records of the existing courts and all causes, proceedings, and criminal prosecutions pending therein as shown by the dockets thereof, except as herein otherwise provided, shall immediately upon the organization of the courts created by this Act be transferred to such new courts having jurisdiction of like cases, be entered upon the dockets thereof, and proceed as if they had originally been brought therein, whereupon all the existing courts, except the Supreme Court of the Canal Zone, shall cease to exist. The President may continue the Supreme Court of the Canal Zone and retain the judges thereof in office for such time as to him may seem necessary to determine finally any causes and proceedings which may be pending therein. All laws of the Canal Zone imposing duties upon the clerks or

ministerial officers of existing courts shall apply and impose such duties upon the clerks and ministerial officers of the new courts created by this Act having jurisdiction of like cases, matters and duties.

All existing laws in the Canal Zone governing practice and procedure in existing courts shall be applicable and adapted to the practice and procedure in the new courts.

The Circuit Court of Appeals of the Fifth Circuit of the United States shall have jurisdiction to review, revise, modify, reverse, or affirm the final judgments and decrees of the District Court of the Canal Zone and to render such judgments as in the opinion of the said appellate court should have been rendered by the trial court in all actions and proceedings in which the Constitution, or any statute, treaty, title, right, or privilege of the United States is involved and a right thereunder denied, and in cases in which the value in controversy exceeds one thousand dollars, to be ascertained by the oath of either party, or by other competent evidence, and also in criminal causes wherein the offense charged is punishable as a felony. And such appellate jurisdiction, subject to the right of review by or appeal to the Supreme Court of the United States as in other cases authorized by law, may be exercised by said circuit court of appeals in the same manner, under the same regulations, and by the same procedure as nearly as practicable as is done in reviewing the final judgments and decrees of the district courts of the United States.

Sec. 10. That after the Panama Canal shall have been completed and opened for operation the governor of the Panama Canal shall have the right to make such rules and regulations, subject to the approval of the President, touching the right of any person to remain upon or pass over any part of the Canal Zone as may be necessary. Any person violating any of such rules or regulations shall be guilty of a misdemeanor, and on conviction in the District Court of the Canal Zone shall be punished by a fine not exceeding five hundred dollars or by imprisonment not exceeding a year, or both, in the discretion of the court. It shall be unlawful for any person, by any means or in any way, to injure or obstruct, or attempt to injure or obstruct, any part of the Panama Canal or the locks thereof or the approaches thereto. Any person violating this provision shall be guilty of a felony, and on conviction in the District Court of the Canal Zone shall be punished by a fine not exceeding ten thousand dollars or by imprisonment not exceeding twenty years, or both, in the discretion of the court. If the act shall cause the death of any person within a year and a day thereafter the person so convicted shall be guilty of murder and shall be punished accordingly.

Sec. 11. That section five of the Act to regulate commerce, approved February fourth, eighteen hundred and eighty-seven, as heretofore amended, is hereby amended by adding thereto a new paragraph at the end thereof, as follows:

"From and after the first day of July, nineteen hundred and fourteen, it shall be unlawful for any railroad company or other common carrier subject to the Act to regulate commerce to own, lease, operate, control, or have any interest whatsoever (by stock ownership or otherwise, either directly, indirectly, through any holding company, or by stockholders or directors in common, or in any other manner) in any common carrier by water operated through the Panama Canal or elsewhere with which said railroad or other carrier aforesaid does or may compete for traffic or any vessel

carrying freight or passengers upon said water route or elsewhere with which said railroad or other carrier aforesaid does or may compete for traffic; and in case of the violation of this provision each day in which such violation continues shall be deemed a separate offense."

Jurisdiction is hereby conferred on the Interstate Commerce Commission to determine questions of fact as to the competition or possibility of competition, after full hearing, on the application of any railroad company or other carrier. Such application my be filed for the purpose of determining whether any existing service is in violation of this section and pray for an order permitting the continuance of any vessel or vessels already in operation, or for the purpose of asking an order to install new service not in conflict with the provisions of this paragraph. The commission may on its own motion or the application of any shipper institute proceedings to inquire into the operation of any vessel in use by any railroad or other carrier which has not applied to the commission and had the question of competition or the possibility of competition determined as herein provided. In such cases the order of said commission shall be final.

If the Interstate Commerce Commission shall be of the opinion that any such existing specified service by water other than through the Panama Canal is being operated in the interest of the public and is of advantage to the convenience and commerce of the people, and that such extension will neither exclude, prevent, nor reduce competition on the route by water under consideration, the Interstate Commerce Commission may, by order, extend the time during which such service by water may continue to be operated beyond July first, nineteen hundred and fourteen. In every case of such extension, the rates, schedules, and practices of such water carrier shall be filed with the Interstate Commerce Commission and shall be subject to the act to regulate commerce and all amendments thereto in the same manner and to the same extent as is the railroad or other common carrier controlling such water carrier or interested in any manner in its operation: *Provided*, Any application for extension under the terms of this provision filed with the Interstate Commerce Commission prior to July first, nineteen hundred and fourteen, but for any reason not heard and disposed of before said date, may be considered and granted thereafter.

No vessel permitted to engage in the coast wise or foreign trade of the United States shall be permitted to enter or pass through said canal if such ship is owned, chartered, operated, or controlled by any person or company which is doing business in violation of the provisions of the Act of Congress approved July second, eighteen hundred and ninety, entitled "An Act to protect trade and commerce against unlawful restraints and monopolies," or the provisions of sections seventy-three to seventy-seven, both inclusive, of an Act approved August twenty-seventh, eighteen hundred and ninety-four, entitled "An Act to reduce taxation, to provide revenue for the Government and for other purposes," or the provisions of any other Act of Congress amending or supplementing the said Act of July second, eighteen hundred and ninety, commonly known as the Sherman Antitrust Act, and amendments thereto, or said sections of the Act of August twenty-seventh, eighteen hundred and ninety-four. The question of fact may be determined by the judgment of any court of the United States of competent jurisdiction in any cause pending before it to which the owners or operators of such ship are parties. Suit may be brought by any shipper or by the Attorney General of the United States.

That section six of said Act to regulate commerce, as heretofore amended, is hereby amended by adding a new paragraph at the end thereof, as follows:

"When property may be or is transported from point to point in the United States by rail and water through the Panama Canal or otherwise, the transportation being by a common carrier or carriers, and not entirely within the limits of a single State, the Interstate Commerce Commission shall have jurisdiction of such transportation and of the carriers, both by rail and by water, which may, or do engage in the same, in the following particulars, in addition to the jurisdiction given by the Act to regulate commerce, as amended June eighteenth, nineteen hundred and ten:

"(a) To establish physical connection between the lines of the rail carrier and the dock of the water carrier by directing the rail carrier to make suitable connection between its line and a track or tracks which have been constructed from the dock to the limits of its right of way, or by directing either or both the rail and water carrier, individually or in connection with one another, to construct and connect with the lines of the rail carrier a spur track or tracks to the dock. This provision shall only apply where such connection is reasonably practicable, can be made with safety to the public, and where the amount of business to be handled is sufficient to justify the outlay.

"The commission shall have full authority to determine the terms and conditions upon which these connecting tracks, when constructed, shall be operated, and it may, either in the construction or the operation of such tracks, determine what sum shall be paid to or by either carrier. The provisions of this paragraph shall extend to cases where the dock is owned by other parties than the carrier involved.

"(b) To establish through routes and maximum joint rates between and over such rail and water lines, and to determine all the terms and conditions under which such lines shall be operated in the handling of the traffic embraced.

"(c) To establish maximum proportional rates by rail to and from the ports to which the traffic is brought, or from which it is taken by the water carrier, and to determine to what traffic and in connection with what vessels and upon what terms and conditions such rates shall apply. By proportional rates are meant those which differ from the corresponding local rates to and from the port and which apply only to traffic which has been brought to the port or is carried from the port by a common carrier by water.

"(d) If any rail carrier subject to the Act to regulate commerce enters into arrangements with any water carrier operating from a port in the United States to a foreign country, through the Panama Canal or otherwise, for the handling of through business between interior points of the United States and such foreign country, the Interstate Commerce Commission may require such railway to enter into similar arrangements with any or all other lines of steamships operating from said port to the same foreign country."

The orders of the Interstate Commerce Commission relating to this section shall only be made upon formal complaint or in proceedings instituted by the commission of its own motion and after full hearing. The orders provided for in the two amendments to the Act to regulate commerce enacted in this section shall be served in the same manner and enforced by the same penalties and proceedings as are the orders of the commission made

under the provisions of section fifteen of the Act to regulate commerce, as amended June eighteenth, nineteen hundred and ten, and they may be conditioned for the payment of any sum or the giving of security for the payment of any sum or the discharge of any obligation which may be required by the terms of said order.

SEC. 12. That all laws and treaties relating to the extradition of persons accused of crime in force in the United States, to the extent that they may not be in conflict with or superseded by any special treaty entered into between the United States and the Republic of Panama with respect to the Canal Zone, and all laws relating to the rendition of fugitives from justice as between the several States and Territories of the United States, shall extend to and be considered in force in the Canal Zone, and for such purposes and such purposes only the Canal Zone shall be considered and treated as an organized Territory of the United States.

SEC. 13. That in time of war in which the United States shall be engaged, or when, in the opinion of the President, war is imminent, such officer of the Army, as the President may designate shall, upon the order of the President, assume and have exclusive authority and jurisdiction over the operation of the Panama Canal and all of its adjuncts, appendants, and appurtenances, including the entire control and government of the Canal Zone, and during a continuance of such condition the Governor of the Panama Canal, shall, in all respects and particulars as to the operation of such Panama Canal, and all duties, matters, and transactions affecting the Canal Zone, be subject to the order and direction of such officer of the Army.

SEC. 14. That this Act shall be known as, and referred to as, the Panama Canal Act, and the right to alter, amend, or repeal any or all of its provisions or to extend, modify, or annul any rule or regulation made under its authority is expressly reserved.

1914—Act of June 15, 1914 (38 Stat. L., 385)—An Act To amend section five of "An Act to provide for the opening, maintenance, protection and operation of the Panama Canal and the sanitation and government of the Canal Zone" approved August twenty-fourth, nineteen hundred and twelve.

[SECTION 1]. That the second sentence in section five of the Act entitled "An Act to provide for the opening, maintenance, protection, and operation of the Panama Canal, and the sanitation and government of the Canal Zone," approved August twenty-fourth, nineteen hundred and twelve, which reads as follows:

"No toll shall be levied upon vessels engaged in the coastwise trade of the United States," be, and the same is hereby, repealed.

SEC. 2. That the third sentence of the third paragraph of said section of said Act be so amended as to read as follows: "When based upon net registered tonnage for ships of commerce the tolls shall not exceed $1.25 per net registered ton, nor be less than 75 cents per net registered ton, subject, however, to the provisions of article nineteen of the convention between the United States and the Republic of Panama, entered into November eighteenth, nineteen hundred and three," *Provided*, That the passage of this Act shall not be construed or held as a waiver or relin-

quishment of any right, the United States may have under the treaty with Great Britain, ratified the twenty-first of February, nineteen hundred and two, or the treaty with the Republic of Panama, ratified February twenty-sixth, nineteen hundred and four, or otherwise, to discriminate in favor of its vessels by exempting the vessels of the United States or its citizens from the payment of tolls for passage through said canal, or as in any way waiving, impairing, or affecting any right of the United States under said treaties, or otherwise, with respect to the sovereignty over or the ownership, control, and management of said canal and the regulation of the conditions or charges of traffic through the same.

1916—Act of August 21, 1916 (39 Stat. L., 527)—An Act Extending certain privileges of canal employees to other officials on the Canal Zone and authorizing the President to make rules and regulations affecting health, sanitation, quarantine, taxation, public roads, self-propelled vehicles, and police powers on the Canal Zone and for other purposes including provisions as to certain fees, money orders and interest deposits.

[Section 1]. That, until otherwise provided by Congress, the President is authorized to make rules and regulations in matters of sanitation, health, and quarantine for the Canal Zone or to modify or change existing rules and regulations and those hereafter made from time to time. Violations of any quarantine regulations provided for herein shall be punished by fine not to exceed $500 or by imprisonment in jail not to exceed ninety days, or by both such fine and imprisonment, in the court's discretion; and a violation of any sanitary regulations hereunder shall be punished by a fine not to exceed $25 or by imprisonment in jail not to exceed thirty days, or by both such fine and imprisonment, in the court's discretion. Each day such violation may continue shall constitute a separate offense.

Sec. 2. That, until otherwise provided by Congress, the President is hereby authorized to make and from time to time change rules and regulations for levying, assessing, and collecting ad valorem, excise, license, and franchise taxes in the Canal Zone, or to modify or change existing rules or regulations for that purpose. Ad valorem taxes imposed shall not exceed one per centum of the value of the property, nor shall franchise or excise taxes exceed two per centum of gross earnings.

Sec. 3. That, until otherwise provided by Congress, it shall be lawful for the President to make, publish, and enforce all rules and regulations for the use of the public roads and highways in the Canal Zone, also for regulating, licensing, and taxing the use and operation of all self-propelled vehicles, using the public highways, including speed limit, signals, tags, license fees, and all detailed regulations which may from time to time be deemed necessary in the exercise of the authority hereby conferred. The taxes on automobiles may be graded according to the value or the power of the machine and such rules and regulations as now exist may be changed by such order from time to time, and any that may be hereafter made may be changed from time to time. The President may make mutual agreements with the Republic of Panama touching the reciprocal use of the highways of the Canal Zone and the Republic of Panama by self-propelled

vehicles touching taxes and license fees, and any other matter of regulation to establish comity for the convenience of the residents of the two jurisdictions.

SEC. 4. That it shall be unlawful to commit any breach of the peace or engage in or permit any disorderly, indecent, or immoral conduct in the Canal Zone. The President is authorized to enforce this provision by making rules and regulations to assert and exercise the police power in the Canal Zone, or for any portion or division thereof, and he may amend or change any such regulation now existing or hereafter made.

SEC. 5. That any person who commits any act or who carries on any business, trade, or occupation in the Canal Zone without complying with the rules and regulations established by the President for the levying, assessing, and collecting of taxes, or who violates any rules or regulations for the use of the public roads and highways, or who violates any rules and regulations touching the licensing, taxes, operation, and use of self-propelled vehicles, or who violates any of the police regulations authorized hereunder, shall be punished by fine not to exceed $25 or by imprisonment in jail not to exceed thirty days, or by both such fine and imprisonment, in the court's discretion.

SEC. 6. That deposit money orders issued in the Canal Zone in lieu of postal savings certificates in accordance with the rules and regulations heretofore established by the President, or that may hereafter be established by him, shall bear interest at a rate not exceeding two per centum per annum.

SEC. 7. That the interest received from the Canal Zone money order funds deposited in banks under Canal Zone regulations shall be available to pay interest on deposit money orders authorized by the preceding section. Such interest shall also be available to pay any losses which are chargeable to the Canal Zone postal service.

SEC. 8. That whenever a customs officer of the Canal Zone shall certify an invoice, landing certificate, or other similar document, or shall register a marine note of protest, or shall perform any notarial services, he shall be authorized to collect a fee equivalent to the fee prescribed by the United States consular regulations for the same act or service when performed by consular officials.

SEC. 9. The laws relating to seamen of vessels of the United States on foreign voyages shall apply to seamen of all vessels of the United States at the Panama Canal Zone, whether such vessels be registered or enrolled and licensed, and the powers in respect of such seamen of such vessels bestowed by law upon consular officers of the United States in foreign ports and upon shipping commissioners in ports of the United States are hereby bestowed upon the shipping commissioner and deputy shipping commissioners on the Panama Canal Zone.

SEC. 10. The President is hereby authorized to make rules and regulations, and to alter or amend the same from time to time, touching the right of any person to enter or remain upon or pass over any part of the Canal Zone; for the detention of any person entering the Canal Zone in violation of such rules and regulations, and return of such person to the country whence he or she came, on the vessel bringing such person to the Canal Zone, or any other vessel belonging to the same owner or interest, and at the expense of such owner or interest; and in addition to the punishment prescribed by this section for violation of any such rules and regulations, the authorities of the Canal Zone may withhold the clearance of such vessel

from any port in the Canal Zone until any fine imposed and the cost of maintenance of such person are paid. Any person violating any of such rules or regulations shall be guilty of a misdemeanor and on conviction in the district court of the Canal Zone shall be punished by a fine not exceeding $500 or by imprisonment not exceeding a year, or both in the discretion of the court. It shall be unlawful for any person by any means or in any way, to injure or obstruct or attempt to injure or obstruct, any part of the Panama Canal or the locks thereof or the approaches thereto. Any person violating this provision shall be guilty of a felony, and on conviction in the district court of the Canal Zone shall be punished by a fine not exceeding $10,000 or by imprisonment not exceeding twenty years, or both, in the discretion of the court. If the act shall cause the death of any person within a year and a day thereafter, the person so convicted shall be guilty of murder and shall be punished accordingly.

SEC. 11. That all laws, orders or ordinances in conflict with this Act are hereby repealed.

1919—Act of October 28, 1919—(41 Stat. L., 305, 322)—An Act to prohibit intoxicating beverage purposes, and to insure an ample supply of alcohol and promote its use in scientific research and in the development of fuel, dye and other lawful industries.

* * * *

SEC. 20. That it shall be unlawful to import or introduce into the Canal Zone, or to manufacture, sell, give away, dispose of, transport, or have in one's possession or under one's control within the Canal Zone, any alcoholic, fermented, brewed, distilled, vinuous, malt, or spirituous liquors, except for sacramental, scientific, pharmaceutical, industrial, or medicinal purposes, under regulations to be made by the President, and any such liquors within the Canal Zone in violation hereof shall be forfeited to the United States and seized: *Provided,* That this section shall not apply to liquor in transit through the Panama Canal or on the Panama Railroad.

That each and every violation of any of the provisions of this section shall be punished by a fine of not more than $1,000 or imprisonment not exceeding six months for a first offence, and by a fine not less than $200 or more than $2,000 and imprisonment not less than one month nor more than five years for a second or subsequent offense.

That all offenses heretofore committed within the Canal Zone may be prosecuted and all penalties therefor enforced in the same manner and to the same extent as if this Act had not been passed.

1926—Act of April 15, 1926 (44 Stat. L., 254, 294). An Act making appropriations for the military and non-military activities of the War Department for the fiscal year ending June 30, 1927, and for other purposes.

* * * *

THE PANAMA CANAL

The limitations on the expenditure of appropriations hereinbefore made in this Act shall not apply to the appropriations for the Panama Canal.

For every expenditure requisite for and incident to the maintenance and operation, sanitation, and civil government of the Panama Canal and Canal Zone, including the following: Compensation of all officials and employees, foreign and domestic newspapers and periodicals; law books not exceeding $500; textbooks and books of reference; printing and binding, including printing of annual report; rent and personal services in the District of Columbia; purchase or exchange of typewriting, adding, and other machines; purchase or exchange, maintenance, repair, and operation of motor-propelled and horse-drawn passenger-carrying vehicles; claims for damages to vessels passing through the locks of the Panama Canal, as authorized by the Panama Canal Act; claims for losses of or damages to property arising from the conduct of authorized business operations; claims for damages to property arising from the maintenance and operation, sanitation, and civil government of the Panama Canal; acquisition of land and land under water, as authorized in the Panama Canal Act; expenses incurred in assembling, assorting, storing, repairing, and selling material, machinery, and equipment heretofore or hereafter purchased or acquired for the construction of the Panama Canal which are unserviceable or no longer needed, to be reimbursed from the proceeds of such sales; expenses incident to conducting hearings and examining estimates for appropriations on the Isthmus; expenses incident to any emergency arising because of calamity by flood, fire, pestilence, or like character not foreseen or otherwise provided for herein: per diem allowance in lieu of subsistence when prescribed by the Governor of the Panama Canal to persons engaged in field work or traveling on official business, pursuant to section 13 of the Sundry Civil Appropriation Act approved August 1, 1914; and for such other expenses not in the United States as the Governor of the Panama Canal may deem necessary best to promote the maintenance and operation, sanitation, and civil government of the Panama Canal, all to be expended under the direction of the Governor of the Panama Canal and accounted for as follows:

For maintenance and operation of the Panama Canal; salary of the governor, $10,000; purchase, inspection, delivery, handling, and storing of materials, supplies, and equipment for issue to all departments of the Panama Canal, the Panama Railroad, other branches of the United States Government, and for authorized sales, payment in lump sums of not exceeding the amounts authorized by the Injury Compensation Act approved September 7, 1916, to alien cripples who are now a charge upon the Panama Canal by reason of injuries sustained while employed in the construction of the Panama Canal; in all, $5,986,094, together with all moneys arising from the conduct of business operations authorized by the Panama Canal Act.

For sanitation, quarantine, hospitals, and medical aid and support of the insane and of lepers and aid and support of indigent persons legally within the Canal Zone, including expenses of their deportation when practicable, and the purchase of artificial limbs or other appliances for indigent persons who were injured in the service of the Isthmian Canal Commission or the Panama Canal prior to September 7, 1916, and including additional compensation to any officer of the United States public Health Service detailed with the Panama Canal as chief quarantine officer, $670,000.

For civil government of the Panama Canal and Canal Zone, including salaries of district judge, $7,500; district attorney, $5,000; marshal, $5,000; and gratuities and necessary clothing for indigent discharged prisoners, $999,980;

Total, Panama Canal, $7,656,074, to be available until expended.

The Governor of the Panama Canal, so far as the expenditure of appropriations contained in this Act may be under his direction, shall, when it is more economical, purchase needed materials, supplies, and equipment from available surplus stocks of the War Department.

In addition to the foregoing sums there is appropriated for the fiscal year 1927 for expenditures and reinvestment under the several heads of appropriation aforesaid, without being covered into the Treasury of the United States, all moneys received by the Panama Canal from services rendered or materials and supplies furnished to the United States, the Panama Railroad Company, the Canal Zone government, or to their employees, respectively, or to the Panama Government, from hotel and hospital supplies and services; from rentals, wharfage, and like service; from labor, materials, and supplies and other services furnished to vessels other than those passing through the canal, and to others unable to obtain the same elsewhere; from the sale of scrap and other by-products of manufacturing and shop operations; from the sale of obsolete and unserviceable materials, supplies, and equipment purchased or acquired for the operation, maintenance, protection, sanitation, and government of the canal and Canal Zone; and any net profits accruing from such business to the Panama Canal shall annually be covered into the Treasury of the United States.

In addition there is appropriated for the operation, maintenance, and extension of waterworks, sewers, and pavements in the cities of Panama and Colon, during the fiscal year 1927, the necessary portions of such sums as shall be paid as water rentals or directly by the Government of Panama for such expenses.

1926—Act of April 20, 1926 (44 Stat. L., 330, 338)—An Act Making appropriations for the Departments of State and Justice and for the Judiciary and for the Departments of Commerce and Labor, for the fiscal year ending June 30, 1927, and for other purposes.

* * * *

PAYMENT TO THE GOVERNMENT OF PANAMA

To enable the Secretary of State to pay to the Government of Panama the fifteenth annual payment, due on February 26, 1927, from the Government of the United States to the Government of Panama under Article 14 of the Treaty of November 18, 1903, $250,000.

PAYMENT TO THE GOVERNMENT OF COLOMBIA

To enable the Secretary of State to pay to the Government of Colombia the fifth payment from the Government of the United States to the Republic of Colombia under Article 2 of the Treaty of April 6, 1914, $5,000,000.

APPENDIX 6

FINANCIAL STATEMENTS

Explanatory Note

Statements showing appropriations, receipts, expenditures and other financial data for a series of years constitute the most effective single means of exhibiting the growth and development of a service. Due to the fact that Congress has adopted no uniform plan of appropriation for the several services and that the latter employ no uniform plan in respect to the recording and reporting of their receipts and expenditures, it is impossible to present data of this character according to any standard scheme of presentation. In the case of some services the administrative reports contain tables showing financial conditions and operations of the services in considerable detail; in others financial data are almost wholly lacking. Careful study has in all cases been made of such data as are available, and the effort has been made to present the results in such a form as will exhibit the financial operations of the services in the most effective way that circumstances permit.

THE PANAMA CANAL

Appropriation Acts 1902 to 1926, Inclusive, in Chronological Order Classified by Purposes

(Excluding private relief and court judgment appropriations)

		Canal construction	Operation and maintenance					Payments to Panama	Grand total
			Maintenance and operation	Sanitation Canal Zone	Civil government Panama Canal and Canal Zone	Increase of compensation	Total		
1902	June 28	$50,000,000.00	.....	.....	.....	.....	.....	.....	$50,000,000.00
1904	Apr. 28	[a]10,000,000.00	.....	.....	.....	.....	.....	.....	10,000,000.00
1905	Dec. 21	11,000,000.00	.....	.....	.....	.....	.....	.....	11,000,000.00
1906	Feb. 27	5,990,786.00	.....	.....	.....	.....	.....	.....	.....
	June 30	25,456,415.08	.....	.....	.....	.....	.....	.....	31,447,201.08
1907	Mar. 4	27,161,367.50	.....	.....	.....	.....	.....	.....	27,161,367.50
1908	Feb. 15	12,178,900.00	.....	.....	.....	.....	.....	.....	.....
	May 27	29,187,000.00	.....	.....	.....	.....	.....	.....	41,365,900.00
1909	Mar. 4	5,458,000.00	.....	.....	.....	.....	.....	.....	.....
		33,638,000.00	.....	.....	.....	.....	.....	.....	39,096,000.00
1910	Feb. 25	76,000.00	.....	.....	.....	.....	.....	.....	.....
	June 25	37,855,000.00	.....	.....	.....	.....	.....	.....	37,931,000.00
1911	Mar. 4	45,560,000.00	.....	.....	.....	.....	.....	.....	45,560,000.00
1912	Aug. 24	28,980,000.00	.....	.....	.....	.....	.....	.....	28,980,000.00
1913	Mar. 4	.....	.....	.....	.....	.....	.....	$250,000.00	.....
	June 23	16,265,393.00	.....	.....	.....	.....	.....	.....	16,515,393.00
1914	Apr. 6	.....	.....	.....	.....	.....	.....	250,000.00	.....
		2,450,000.00	.....	.....	.....	.....	.....	.....	.....
	Aug. 1	20,718,000.00	.....	.....	.....	.....	.....	.....	.....
	25	6,000.00	.....	.....	.....	.....	.....	.....	23,424,000.00
1915	Jan. 25	.....	.....	.....	.....	.....	.....	250,000.00	.....
	Mar. 3	10,500,000.00	.....	.....	.....	.....	.....	.....	.....
		.....	$5,200,000.00	$700,000.00	$540,000.00	.....	$6,440,000.00	.....	17,190,000.00
1916	Feb. 28	.....	.....	.....	.....	.....	.....	250,000.00	.....
	July 1	.....	.....	.....	.....	.....	.....	250,000.00	.....
		9,750,000.00	.....	.....	.....	.....	.....	.....	.....
		.....	5,750,000.00	700,000.00	600,000.00	.....	7,050,000.00	.....	17,300,000.00

[a] This amount paid to the Republic of Panama but is classed as construction expense since it was an essential preliminary to starting

APPROPRIATION ACTS 1902 TO 1926, INCLUSIVE, IN CHRONOLOGICAL ORDER CLASSIFIED BY PURPOSES—*Continued*

		Canal construction	Operation and maintenance					Payments to Panama	Grand total
			Maintenance and operation	Sanitation Canal Zone	Civil government Panama Canal and Canal Zone	Increase of compensation	Total		
1917	Mar. 3	.....	.....	.....	.....	.....	.....	250,000.00	.....
	June 12	2,755,000.00	.....	.....	.....	.....	.....	.....	.....
		.....	9,000,000.00	700,000.00	700,000.00	$10,006.22	10,410,006.22	.....	13,415,006.22
1918	Mar. 28	593,190.00	.....	.....	.....	.....	.....	.....	.....
	Apr. 15	.....	.....	.....	.....	.....	.....	250,000.00	.....
	June 4	.....	.....	150,000.00	.....	.....	.....	.....	.....
	July 1	.....	9,000,000.00	900,000.00	750,000.00	.....	.....	.....	.....
	3	.....	.....	.....	.....	16,000.00	10,816,000.00	.....	11,659,190.00
1919	Mar. 1	.....	.....	.....	.....	32,592.66	.....	.....	.....
	Apr. 15	.....	.....	.....	.....	.....	.....	250,000.00	.....
	July 19	729,898.00	.....	.....	.....	.....	.....	.....	.....
		.....	7,547,939.00	850,000.00	702,000.00	.....	.....	.....	.....
	Nov. 4	.....	.....	.....	150,000.00	.....	9,282,531.66	.....	10,262,429.66
1920	May 29	.....	.....	.....	.....	34,500.00	.....	.....	.....
	June 4	.....	.....	.....	.....	.....	.....	250,000.00	.....
	5	.....	7,531,851.00	850,000.00	900,000.00	.....	9,316,351.00	.....	9,566,351.00
1921	Mar. 1	714,007.39	.....	.....	.....	.....	.....	.....	.....
		.....	.....	.....	24,670.00	.....	.....	.....	.....
	2	.....	.....	.....	.....	.....	.....	250,000.00	.....
	4	.....	7,250,000.00	850,000.00	900,000.00	21,500.00	9,046,170.00	.....	10,010,177.39
1922	June 1	.....	.....	.....	.....	.....	.....	250,000.00	.....
	30	.....	2,659,434.00	525,000.00	930,000.00	16,800.00	4,131,234.00	.....	4,381,234.00
1923	Jan. 3	.....	.....	.....	.....	.....	.....	250,000.00	.....
	Mar. 2	.....	5,079,683.00	575,000.00	930,000.00	17,520.00	6,602,203.00	.....	6,852,203.00
1924	May 28	.....	.....	.....	.....	.....	.....	250,000.00	.....
	June 7	.....	5,748,160.00	580,000.00	912,000.00	.....	7,240,160.00	.....	7,490,160.00
1925	Feb. 12	.....	7,243,050.00	659,482.00	1,021,820.00	.....	8,924,352.00	.....	.....
	27	.....	.....	.....	.....	.....	.....	250,000.00	9,174,352.00
1926	Apr. 15	.....	5,986,094.00	670,000.00	999,980.00	.....	7,656,074.00	.....	.....
	29	.....	.....	.....	.....	.....	.....	250,000.00	7,906,074.00
		$387,022,956.97	$77,996,211.00	$8,709,482.00	$10,060,470.00	$148,918.88	$96,915,081.88	$3,750,000.00	$487,688,038.85

APPROPRIATIONS AND EXPENDITURES (EXCLUDING DEFENSE), FISCAL YEARS 1915 TO 1927, INCLUSIVE

Item	1915			1916		
	Balance	Appropriation	Expenditure	Balance	Appropriation	Expenditure
Appropriations without year						
Panama Canal Fund	[a]$3,975,076.28	$6,313,506.45	$8,245,369.01	$2,043,213.72	.....	$1,547,610.89
Civil Government	.....	540,000.00	54,000.00	486,000.00	.....	482,479.57
Construction and equipment	.....	10,500,000.00	300,000.00	10,200,000.00	.....	7,912,780.63
Canal, connecting Atlantic and Pacific Oceans	813,642.55	.....	328,573.53	485,069.02	.....	2,607.24
Maintenance and operation	.....	5,200,000.00	1,000,000.00	4,200,000.00	.....	4,064,855.57
Sanitation, Canal Zone	.....	700,000.00	70,000.00	630,000.00	.....	625,052.20
Payment to employees for injuries	3,500.00	.....	2,000.00	1,500.00	.....	.....
Presenting steam yacht *Louise* to French Government	.....	6,000.00	.....	6,000.00	.....	5,840.99
Relief of certain employees for injuries	.....	5,510.99	5,510.99	.....	.....	.....
Judgments, U S Courts	.....	9,489.76	9,489.76	.....	.....	.....
Payment to McClintock-Marshal Construction Co	.....	.....	.....	.....	.....	.....
Canal Zone payrolls	[b]	.....	[c]8,825.54	.....	.....	.....
Incidental expenses in the United States, Isthmian Canal	[b]	[d]41,072.32	41,072.32	.....	.....	.....
Incidental expenses on Isthmus	[b]	[e]353,416.46	353,416.46	.....	.....	.....
Isthmus payrolls	[b]	[f]4,435,160.61	4,435,160.61	.....	.....	.....
Material and expenses	[b]	[g]37,611.09	37,611.09	.....	.....	.....
Material and expenses on Isthmus, Sanitary Department	[b]	[h]115,395.27	115,395.27	.....	.....	.....
Miscellaneous material purchases	[b]	[i]7,499,534.94	7,449,534.94	.....	.....	.....
Pay of officers and employees	[b]	[j]104,408.82	104,408.82	.....	.....	.....
Pay of officers and employees on Isthmus	[b]	[k]1,483,115.26	1,483,115.26	.....	.....	.....
Pay of sanitary officers and employees on Isthmus	[b]	[l]222,970.05	222,970.05	.....	.....	.....
Relocation of Panama Railroad	[b]	.....	[c]47,121.01	.....	.....	.....
Salaries in the United States	[b]	[m]74,305.89	74,305.89	.....	.....	.....
Sanitary payrolls on Isthmus	[b]	[n]53,449.39	53,449.39	.....	.....	.....
Sanitation in cities of Panama and Colon	[b]	.....	.....	.....	.....	.....
Total	$4,792,218.83	[o]$37,679,000.75	$24,419,436.84	$18,051,782.74	.....	$14,641,227.09

[a] Composed of balances transferred. See Footnote b.
[b] Balance transferred to "Panama Canal Fund."
[c] Repayment, transferred to "Panama Canal Fund."
[d] Exclusive of $20,927.68 transferred to "Panama Canal Fund."
[e] Exclusive of $371,583.54 transferred to "Panama Canal Fund."
[f] Exclusive of $2,564,839.39 transferred to "Panama Canal Fund."
[g] Exclusive of $34,388.91 transferred to "Panama Canal Fund."
[h] Exclusive of $259,604.73 transferred to "Panama Canal Fund."
[i] Exclusive of $1,550,465.06 transferred to "Panama Canal Fund."
[j] Exclusive of $305,591.18 transferred to "Panama Canal Fund."
[k] Exclusive of $930,884.74 transferred to "Panama Canal Fund."
[l] Exclusive of $77,029.95 transferred to "Panama Canal Fund."
[m] Exclusive of $75,604.11 transferred to "Panama Canal Fund."
[n] Exclusive of $66,550.61 transferred to "Panama Canal Fund."
[o] Less repayments footnoted "b" totaling $55,946.55.

APPROPRIATIONS AND EXPENDITURES (EXCLUDING DEFENSE), FISCAL YEARS 1915 TO 1927, INCLUSIVE—*Continued*

Item	1917			1918		
	Balance	Appropriation	Expenditure	Balance	Appropriation	Expenditure
Appropriations without year						
Panama Canal Fund	$495,602.83	.....	[a]$139,377.56	$634,980.39	.....	$366,081.26
Civil Government	3,520.43	$600,000.00	597,350.51	6,169.92	$700,000.00	673,571.44
Construction and equipment	2,387,219.37	6,750,000.00	8,625,125.94	3,412,093.43	3,348,190.00	3,704,126.93
Canal connecting Atlantic and Pacific Oceans	482,461.78	.....	222,013.77	260,448.01	.....	3,314.54
Maintenance and operation	135,144.43	5,750,000.00	5,883,772.46	1,371.97	9,000,000.00	7,754,959.59
Sanitation, Canal Zone	4,947.80	1,400,000.00	750,380.65	654,567.15	150,000.00	797,708.80
Payment to employees for injuries	1,500.00	.....	.....	1,500.00	.....	.....
Presenting steam yacht *Louise* to French Government	159.01	.....	.....	159.01	.....	.....
Relief of certain employees for injuries	.....	4,200.00	4,200.00	.....	.....	.....
Judgments, U. S. Courts	.....	.....	.....	.....	.....	.....
Payment to McClintick-Marshall Construction Co	.....	.....	.....	.....	.....	.....
Appropriations with year						
Increase of compensation	.....	.....	.....	.....	10,006.22	[b]10,006.22
Censorship of foreign mails, Panama Canal Zone	.....	.....	.....	.....	.....	.....
Regulating commerce, etc., Panama Canal	.....	.....	.....	.....	.....	.....
Total	$3,410,555.65	$17,504,200.00	$16,082,843.33	$4,971,289.88	$13,208,196.22	$13,309,768.78

[a] Repayment. [b] $782.20 returned to surplus.

APPROPRIATIONS AND EXPENDITURES (EXCLUDING DEFENSE), FISCAL YEARS 1915 TO 1927, INCLUSIVE—*Continued*

Item	1919			1920		
	Balance	Appropriation	Expenditure	Balance	Appropriation	Expenditure
Appropriations without year						
Panama Canal Fund	$268,899.13	.....	$223,985.35	$44,913.78	.....	$31,818.77
Civil Government	32,598.48	$750,000.00	779,678.64	2,919.84	$852,000.00	763,549.70
Construction and equipment	3,056,156.59	.....	1,434,323.94	1,621,832.56	729,898.00	831,174.92
Canal connecting Atlantic and Pacific Oceans	257,133.47	.....	68,548.58	188,584.89	.....	[a]16,613.21
Maintenance and operation	1,246,412.38	9,000,000.00	7,097,060.06	3,149,352.32	7,547,939.00	3,510,456.59
Sanitation, Canal Zone	6,858.35	900,000.00	897,977.82	8,880.53	850,000.00	838,020.01
Payment to employees for injuries	1,500.00	.....	.....	1,500.00	.....	.....
Presenting steam yacht *Louise* to French Government	159.01	.....	.....	159.01	.....	.....
Relief of certain employees for injuries	.....	.....	.....	.....	.....	.....
Judgments, U. S. Courts	.....	.....	.....	.....	.....	.....
Payment to McClintick-Marshall Construction Co	.....	.....	.....	.....	.....	.....
Appropriations with year						
Increase of compensation	.....	16,000.00	[b]16,000.00	.....	32,592.66	[e]32,592.66
Censorship of foreign mails, Panama Canal Zone	.....	120,000.00	[d]120,000.00	.....	.....	.....
Regulating commerce, etc., Panama Canal	.....	[e]50,000.00	[f]50,000.00	.....	.....	.....
Total	$4,869,717.32	$10,836,000.00	$10,687,574.39	$5,018,142.93	$10,012,429.66	$5,990,999.44

[a] Repayment.
[b] $470.07 returned to surplus.
[c] $2,516.90 returned to surplus.
[d] $53,205.21 returned to surplus.
[e] Transferred from "Salaries and Expenses War Trade Board, 1919."
[f] $21,566.80 returned to surplus.

APPROPRIATIONS AND EXPENDITURES (EXCLUDING DEFENSE), FISCAL YEARS 1915 TO 1927, INCLUSIVE—*Continued*

Item	1921			1922		
	Balance	Appropriation	Expenditure	Balance	Appropriation	Expenditure
Appropriations without year						
Panama Canal Fund	$13,095.01	.....	[a]$118,897.07	$131,992.08	.....	$3,000.00
Civil Government	91,370.14	$924,670.00	994,376.55	21,663.59	$900,000.00	855,323.90
Construction and equipment	1,520,555.64	.....	1,177,234.93	343,320.71	.....	54,405.38
Canal connecting Atlantic and Pacific Oceans	205,198.10	.....	184,410.98	20,787.12	.....	[a]7,202.54
Maintenance and operation	7,186,834.73	7,531,851.00	12,416,449.05	2,302,236.68	7,250,000.00	1,364,622.03
Sanitation, Canal Zone	20,860.52	850,000.00	858,767.68	12,092.84	850,000.00	532,541.33
Payment to employees for injuries	1,500.00	.....	.....	1,500.00	.....	.....
Presenting steam yacht *Louise* to French Government	159.01	.....	159.01	.....	.....	.....
Relief of certain employees for injuries	.....	.....	.....	.....	.....	.....
Judgments, U. S. Courts	.....	.....	.....	.....	.....	.....
Payment to McClintick-Marshall Construction Co	.....	714,007.39	714,007.39	.....	.....	.....
Appropriations with year						
Increase of compensation	.....	34,500.00	[b]34,500.00	.....	21,500.00	[c]21,500.00
Censorship of foreign mails, Panama Canal Zone	.....	.....	.....	.....	.....	.....
Regulating commerce, etc., Panama Canal	.....	.....	.....	.....	.....	.....
Total	$9,039,573.15	$10,055,028.39	$16,261,008.52	$2,833,593.02	$9,021,500.00	$2,824,190.10

[a] Repayment. [b] $3,208.81 returned to surplus. [c] $615.65 returned to surplus.

APPROPRIATIONS AND EXPENDITURES (EXCLUDING DEFENSE), FISCAL YEARS 1915 TO 1927, INCLUSIVE—*Continued*

Item	1923			1924		
	Balance	Appropriation	Expenditure	Balance	Appropriation	Expenditure
Appropriations without year						
Panama Canal Fund	$128,992.08	.....	[a]$128,992.08	.....	[b]$2,911.66	[c]$2,911.66
Civil Government	66,339.69	$930,000.00	930,311.68	$66,028.01	930,000.00	910,303.39
Construction and equipment	288,915.33	.....	16,405.36	272,509.97	.....	100,000.00
Canal connecting Atlantic and Pacific Oceans	27,989.66	.....	27,989.66	.....	.....	.....
Maintenance and operation	8,187,614.65	2,659,434.00	2,117,395.94	8,729,652.71	5,079,683.00	5,523,338.76
Sanitation, Canal Zone	329,551.51	525,000.00	567,554.95	286,996.56	575,000.00	638,879.65
Payment to employees for injuries	1,500.00	.....	.....	1,500.00	.....	.....
Presenting steam yacht *Louise* to French Government	.....	.....	.....	.....	.....	.....
Relief of certain employees for injuries	.....	.....	.....	.....	.....	.....
Judgments, U. S. Courts	.....	.....	.....	.....	.....	.....
Payment to McClintick-Marshall Construction Co	.....	.....	.....	.....	.....	.....
Appropriations with year						
Increase of compensation	.....	16,800.00	16,800.00	.....	17,520.00	17,466.68
Censorship of foreign mails, Panama Canal Zone	.....	.....	.....	.....	.....	.....
Regulating commerce, etc., Panama Canal	.....	.....	.....	.....	.....	.....
Total	$9,030,902.92	$4,131,234.00	$3,805,449.67	$9,356,687.25	$6,605,114.66	$7,192,900.14

[a] $127,940.99 returned to surplus. [b] Repayment. [c] Returned to surplus.

APPROPRIATIONS AND EXPENDITURES (EXCLUDING DEFENSE), FISCAL YEARS 1915 TO 1927, INCLUSIVE—*Continued*

Item	1925			1926		1927
	Balance	Appropriation	Expenditure	Balance	Appropriation	Appropriation
Appropriations without year						
Panama Canal Fund	.....	.....	.....	.....	.....	.....
Civil Government	$85,724.62	$991,670.00	$974,755.25	$102,639.37	$1,021,820.00	$999,980.00
Construction and equipment	172,509.97	.....	91,584.21	80,925.76	.....	.....
Canal connecting Atlantic and Pacific Oceans	.....	.....	.....	.....	.....	.....
Maintenance and operation	8,285,996.95	5,851,210.00	7,354,449.48	6,782,757.47	7,243,050.00	5,986,094.00
Sanitation, Canal Zone	223,116.91	586,266.00	663,670.01	145,712.90	659,482.00	670,000.00
Payment to employees for injuries	1,500.00	.....	.....	1,500.00	.....	.....
Presenting steam yacht *Louise* to French Government	.....	.....	.....	.....	.....	.....
Relief of certain employees for injuries	.....	.....	.....	.....	.....	.....
Judgments, U. S. Courts	.....	.....	.....	.....	.....	.....
Payment to McClintick-Marshall Construction Co	.....	.....	.....	.....	.....	.....
Appropriations with year						
Increase of compensation	53.32	.....	[a]74.04	127.36	.....	.....
Censorship of foreign mails, Panama Canal Zone	.....	.....	.....	.....	.....	.....
Regulating commerce, etc., Panama Canal	.....	.....	.....	.....	.....	.....
Total	$8,768,901.77	$7,429,146.00	$9,084,384.91	$7,113,662.86	$8,924,352.00	$7,656,074.00

[a] Includes a repayment of $107.36 and a return to surplus of $33.32.

Revenues and Expenses, Fiscal Years 1914 to 1925, Inclusive

	Canal transit operations					Canal business operations			Total net revenues
	Tolls	Taxes, licenses, fees, fines, postal receipts, etc.	Total transit revenues	Net canal transit expenses	Net revenues	Revenues	Expenses	Net revenues	
1914	$14,618.68	.....	$14,618.68	$166,030.91	[a]$151,412.23	$690,298.32	$695,720.71	$5,422.39	[a]$156,834.62
1915	4,343,383.69	.....	4,343,383.69	4,123,128.09	220,255.60	2,135,074.92	2,191,475.70	56,400.78	163,854.82
1916	2,399,830.42	$158,711.96	2,558,542.38	6,999,750.15	4,441,207.77	6,488,521.61	6,476,623.17	11,898.44	[a]4,429,309.33
1917	5,631,781.66	176,617.04	5,808,398.70	6,788,047.60	[a]979,648.90	7,579,588.44	7,540,160.78	39,427.66	[a]940,221.24
1918	6,264,765.71	147,077.57	6,411,843.28	5,920,342.94	491,500.34	10,324,071.91	10,317,912.35	6,159.56	497,659.90
1919	6,156,118.95	197,898.03	6,354,016.98	6,112,194.77	241,822.21	13,684,881.18	13,623,853.92	61,027,26	302.849.47
1920	8,493,082.56	442,789.01	8,935,871.57	6,548,272.43	2,387,599.14	14,705,371.82	14,465,685.69	239,686.13	2,627,285.27
1921	11,261,919.31	778,197.39	12,040,116.70	9,328,300.14	2,711,816.56	15,232,317.08	14,668,105.88	564,211.20	3,276,027.76
Total	$44,565,500.98	$1,901,291.00	$46,466,791.98	$45.986,067.03	$480,724.95	$70,840,125.28	$69,979,538.20	$860,587.08	$1,341,312.03
Adjustment [b]	.....	480,724.95	480,724.95	.....	480,724.95	.....	.....	.....	.....
Profit [c]	.....	.....	.....	.....	.....	.....	379,862.13	[a]379,862.13	.....
Net revenues [d]	.....	.....	.....	.....	.....	$70,840,125.28	$70,359,400.33	$480,724.95	.....
Interest [e]	.....	.....	.....	.....	.....	619,584.59	.....	619,584.59	.....
Adjusted status, 1921	$44,565,500.98	$1,420,566.05	$45,986,067.03	$45,986,067.03	.....	$71,459,709.87	$70,359,400.33	$1,100,309.54	$1,100,309.54
1922	11,193,383.47	192,208.85	11,385,592.32	7,919,017.63	$3,466,574.69	7,747,227,57	7,423,968.41	323,259.16	3,789,833.85
1923	17,507,630.52	184,213.54	17,691,844.06	7,690,777.56	10,001,066.50	10,872,843.36	9,732,200.86	1,140,642.50	11,141,709.00
1924	24,289,603.16	392,250.73	24.681,853.89	8,373,905.39	16,307,948.50	12,968,777.29	12,067,153.17	901,624.12	17,209,572.62
1925	21,374,664.12	207,954.04	24,582,618.16	8,116,693.44	13.465,924.72	14,612,838.86	13,846,922.01	765.916.85	14,231,841.57
Grand total	$118.930,782.25	$2,397,193.21	$121,327,975.46	$78,086,461.05	$43.241,514.41	$117,661,396.95	$113,429,644.78	$4,231,752.17	$47,473,266.58

[a] Deficit.
[b] Carried to business surplus.
[c] Carried in transit accounts.
[d] Carried to surplus.
[e] On public works at Panama and Colon not previously included in net revenues.

APPENDIX 7

BIBLIOGRAPHY

Explanatory Note[1]

The bibliographies appended to the several monographs aim to list only those works which deal directly with the services to which they relate, their history, activities, organization, methods of business, problems, etc. They are intended primarily to meet the needs of those persons who desire to make a further study of the services from an administrative standpoint. They thus do not include the titles of publications of the services themselves except in so far as they treat of the services, their work and problems. Nor do they include books or articles dealing merely with technical features other than administrative of the work of the services. In a few cases explanatory notes have been appended where it was thought they would aid in making known the character or value of the publication to which they relate.

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